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# The Impact of Diversification on Bank Holding Company Performance

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**THE IMPACT OF DIVERSIFICATION ON BANK HOLDING  
COMPANY PERFORMANCE**

**CHINPIAO LIU**

**THE IMPACT OF DIVERSIFICATION ON BANK HOLDING  
COMPANY PERFORMANCE**

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# **THE IMPACT OF DIVERSIFICATION ON BANK HOLDING COMPANY PERFORMANCE**

CHINPIAO LIU

## **ABSTRACT**

Bank holding companies (BHCs) are hypothesized to achieve potential portfolio and synergistic benefits through various forms of diversification. On the other hand, diversification can generate new managerial problems or agency costs. This dissertation examines five issues. 1) Do all the various forms of diversification have the same favorable/unfavorable effects on BHCs' performance?, 2) Are there any interaction effects among the various types of diversification?, 3) Since the business strategies of large BHCs are different from those of small BHCs, do the diversification effects vary by size?, 4) How did diversification impact BHC performance during the 2007-2008 financial crisis?, and 5) What types of diversification-associated M&A should BHCs employ to take advantages of diversification benefits?

**Overall Results** - The study finds that not all forms of diversifications have the same impacts on BHCs' performance. Some types of diversification support the hypothesis of favorable portfolio benefits and cost synergies, while other findings support the hypothesis of unfavorable agency costs. Non-interest-income diversification has the strongest favorable impacts on BHCs' performance as it both increases returns and reduces portfolio risk. Security diversification has unfavorable impacts on accounting returns but favorable impacts on market returns. Off-balance-sheet diversification has unfavorable impacts on risk and it does not contribute to BHCs' returns. The largest

unfavorable impact is on derivatives losses.

Moreover, for some diversification measures, the impacts depend on the scale of their associated activities. When the scale of the diversified activity is large enough, the net diversification impact may change its sign. In general, among the various diversified activities where the sign of the impacts switch with scales, loan diversification switches direction from favorable to unfavorable. BHCs might tend to make increasingly risky loans when their scale of loans expands. Moreover, agency problems might also become difficult to control. On the other hand, security diversification tends to switch the direction of impact from unfavorable to favorable. With larger security portfolios, BHCs are more capable of reducing risk and increasing returns with a wide selection of securities.

**Results for Various Size Banks** - For small banks, larger community banks, and regional BHCs, non-interest-income and loan diversifications generally enhance performance while security portfolio and off-balance sheet diversifications reduce performance. For very large money center banks, diversification into off-balance-sheet activities generates the strongest performance benefit, while domestic geographic, loan and non-interest income diversifications also have favorable impacts. On the other hand, security portfolio diversification has a mix of both favorable and unfavorable effects. Focusing on BHCs with international loan portfolios, off-balance-sheet diversification creates the strongest performance benefits, followed by domestic geographic diversification. On the other hand, international geographic and loan diversifications, along with security portfolio and non-interest income diversifications reduce bank performance.

Over all, it appears that larger banks (with the exception of international banks) achieve more favorable diversification benefits. On the other hand, the interaction effects of various forms of diversifications appear to benefit small BHCs the most. Smaller

BHCs may not benefit through single channel diversification because doing so likely increases operating costs while the bank remains unable to fulfill their target customers' full range of service needs. However, by multi-channel diversification, the interaction benefits of diversifications can be achieved. On the other hand, larger BHCs can benefit through single channel diversification because they have more market power and are able to enjoy the benefits of diversified portfolios and cost synergies generated through economies of scale. However, multi-channel diversification may make larger BHCs more difficult to manage. For example, they might engage in unfamiliar and risky business where operating and agency costs offset potential portfolio benefits.

Overall, diversification generally supports the hypothesis of favorable portfolio benefits and cost synergies. Furthermore, diversification has a consistently more favorable impact during the recent financial crisis. In general, BHCs with widely diversified activities will suffer less than other BHCs with concentrated activities when financial crisis occurs.

**Impact of Merger Activity** - The study also finds that M&A activity associated with several forms of diversification improve BHC performance, while the other forms of diversification have insignificant impacts on performance. The overall implications for BHCs are that not all diversification-driven mergers generate benefits for BHCs. Hence, BHCs should choose the right mergers which meet their business goals.



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# **CHAPTER I**

## **INTRODUCTION**

### **1.1 Background**

Deregulations in recent decades have been believed to fundamentally change the U. S. banking industry. For example, Riegle-Neal Act of 1994 allows banks to have branches across the country rather than restricted to a single state. Smaller, less efficient community banks lose protection of the geographic restriction and face the competition from larger, more efficient banks. Calomiris (2000) suggests that geographic restriction creates smaller banks and inhibit diversification, thus making banks more vulnerable to economic downturns. The Gramm-Leach-Bliley Act of 1999 (GLBA) removes many restrictions on financial service providers. GLBA allows banks to engage in a host of new activities like brokerage, underwriting, and advisory. Banks shift away from traditional lending activities and toward activities that generate fee income, service charges, trading revenue, and other types of non-interest income. This shift toward noninterest income activities substantially contribute to bank revenue and change the risk of bank portfolios. Risky off-balance sheet activities, such as loan commitments, letters of credit, derivatives, etc., have become popular. Such activities might bring banks huge profits but be beyond



regulatory control. The purpose of all the deregulations is to enable banks to expand business and gain financial benefits.

With the potential of financial benefits, bank holding companies (BHCs) have incentives to initiate new activities to diversify their portfolios. The most common way for banks to expand business is to employ merger and acquisition (M&A). The aggregate impact of M&A on bank performance has been well documented in the literature. Pilloff (1996), Houston et al. (2001), and Penas and Unal (2004) show that M&A activities in the banking industry can achieve cost savings, synergy gains and market power increases. M&A activities are basically associated with several types of diversification, such as domestic and international geographic diversification, loan diversification, security diversification, noninterest income diversification and off-balance sheet diversification. The portfolio theory predicts that diversification could help banks reach economies of scope and scale that boost performance. Diamond (1991), Rajan (1992), Saunders and Walter (1994), and Stein (2002) suggest that banks can facilitate the efficient provision of other financial services, such as underwriting of securities and insurance, brokerage and mutual fund services, etc., by acquiring information about clients when they make loans. Similarly, these services can produce information that improve loan making. Thus, banks that engage in diversification of activities can enjoy economies of scope. Santomero and Eckles (2000) and Berger, DeYoung, Genay, and Udell (2000) suggest that bank branching can reduce costs as output expands. Banks that engage in geographic diversification can enjoy economies of scale. However, the agency theory predicts differently that diversification could intensify agency problems between bank insiders and shareholders. Aron (1988), Stulz (1990), and Rotemberg and Saloner (1994) indicate that diversification may make it more difficult to design efficient managerial incentive contracts and more difficult to align the incentives of outsiders with insiders. Insiders will still diversify if their marginal private benefits exceed the losses that they incur from the

drop in market valuation. Therefore, although a large body of literature tests the impact of M&A on bank performance, what types of M&A and their corresponding diversifications which incur better or worse performance is still an unsolved question.

The adoption of an internal ratings-based (IRB) approach to determining minimum capital requirement, proposed as part of the Basel II capital accord, also provides banks with incentives to increase their M&A activities and, then, diversify their activities. Because banks' internal assessments of key risk considerations serve as primary inputs in the calculation of minimum regulatory capital requirements, it is likely that banks which adopt the IRB approach can create lower minimum regulatory capital requirements than the minimum regulatory capital requirements applied to the majority of banks that will not adopt the IRB approach. The disparity of minimum regulatory capital requirements between these two types of banks provides a competitive advantage to the initial adopters. Therefore, both the excess capital that would be created by IRB banks as a result of reduced capital requirements and the competitive advantage associated with those reduced requirements would fuel their acquisitions of non-adopting banks (Hannan and Pilloff, 2005). Therefore, for large banks, diversification is a way which may reduce risk and enhance their performance.

Goldstein and Pauzner (2004) argue that contagion of financial crises occurs because investment portfolios are diversified across countries. The fact that different countries share the same group of investors leads to the transmission of negative shocks from one part of the world to another. In the summer of 2007, the financial crisis emerging from the U.S. gradually spread to the rest of the world because international investors are heavily involved in asset-backed securities. The asset-backed securities composed of risky subprime mortgages were packaged and sold to investors worldwide. Mizen (2008) argues that the crisis originated from an increase in subprime mortgage defaults starting in February 2007. In April, New Century Financial, a subprime specialist, filed for

Chapter 11 bankruptcy. In early May 2007, the Swiss-owned investment bank UBS closed the Dillon Reed hedge fund after incurring \$125 million in subprime mortgage-related losses. In the same month, Moody's announced the reviewing of the ratings of 62 asset groups based on 21 U.S. subprime mortgage securitizations. In June and July 2007, three ratings agencies, Fitch Ratings, Standard & Poor's, and Moody's, all downgraded a wide range of subprime-related mortgage products. Thereafter, a U.S. mortgage bank experienced large losses and two European banks closed hedge funds in troubled situation.

The stable macroeconomic condition in the late 1990s (reduced macroeconomic volatility), the global savings glut (lower long-term interest rates), and the sophisticated subprime mortgage-backed assets with relatively high yield and presumably good credit ratings provided supportive environment for excessive credit expansion. Among the various factors which give rise to the financial crisis, the new asset-backed financial products play the key roles. Because of the high risk of some asset-backed securities, the events of financial crisis during 2007-2008 might constitute indirect evidence that financial institutions which diversify into high risk activities, often perform much worse than BHCs which do not diversify as such (The current AIG crisis being a prime example). Thus diversification may not necessarily reduce risk as portfolio theory often suggests. Specifically, some activities may generate higher risk for the resulting firm rather than leading to a reduction in risk.

The financial crisis provides a good opportunity to examine the effect of diversification on BHCs performance. The effect before the crisis should be different from that during the crisis period since the U.S. government has taken several dramatic steps to ease the credit crisis. In addition to reducing short-term interest rates, the Federal Reserve has taken additional steps to improve the functioning of the credit markets and to increase the supply of credit to households and businesses (Bernanke, 2009). First, the

Federal Open Market Committee (FOMC) began to ease monetary policy in September 2007, reducing the target for the federal funds rate by 50 basis points. Because the economic weakness persisted, the FOMC continued to bring down its target for the federal funds rate by 275 basis points by the spring of 2008. Unfortunately, the financial turbulence kept deteriorating. In October 2008 the Committee cut the target for the federal funds rate by additional 100 basis points, and in December it cut the target further, setting a range of 0 to 25 basis points. Second, the Fed provided massive short-term liquidity to both trouble and sound financial institutions, increasing the ability, if not the willingness, of these institutions to expand credit. Moreover, the Fed also approves temporary bilateral liquidity agreements with 14 foreign central banks to ease conditions in dollar funding markets globally. Improvements in global interbank markets, in turn, promote greater stability in money markets and foreign exchange markets. Third, the Fed provided liquidity directly to borrowers and investors in key credit markets. For example, the Fed introduces facilities to purchase highly rated commercial paper at a term of three months and to provide backup liquidity for money market mutual funds. In addition, the Fed and the Treasury jointly announce a facility to lend against AAA-rated asset-backed securities. These approaches are expected to lead to lower rates and greater availability of consumer, business, and mortgage credit. Fourth, the Fed purchased long-term securities for the Fed's portfolio, such as, the debt of government-sponsored enterprises and mortgage-backed securities guaranteed by federal agencies (e.g., Fannie Mae and Ginnie Mae).

## **1.2 Research Objectives**

The impact of individual channel of diversification on bank holding companies'

(BHCs) return and risk has been documented in the literature. However, their results are still mixed. Some papers show performance enhancement but some do not. Very few of prior papers consider the possibility of the interaction effects among different channels of diversification. Almost all of them examine the relationship between BHCs' performance and diversification by either concentrating on a single diversification channel or running separate model for each channel. Interaction effects among channels of diversification are ignored. Interaction effects may play an important role in explaining BHCs' performance. BHCs may expand their activities by employing different channels simultaneously to satisfy the specific needs of their target customers in different areas. For example, customers in area A need service "A", while customers in area B need service "B". Suppose that a BHC is headquartered in area A and provides service "A" to its customers in the area. There are two ways for the BHC to expand, geographically or multi-service. If the BHC only expands geographically, it still cannot provide services to the target customers in area B because they need service "B", not "A". However, costs will arise without generating any benefit due to operating a new branch. On the other hand, if the BHC only expands services to include "B", it still cannot provide more services to customers in area A because the customers in area A do not need service "B". Once again the bank experiences increased costs of providing service "B". However, the BHC may adopt both geographic diversification and service diversification. It can provide service "A" to customers in area A and service "B" to customers in area B. The multi-channel diversification can decrease operating costs and increase synergies. Therefore, the interaction effect is theoretically existent. However, no prior papers integrate different types of diversification in a single model and examine their interaction effects. Although, in some papers, their empirical results for individual channels of diversification may not show financial benefits, we still cannot conclude that this channel has no effect on BHCs performance without examining other channels simultaneously. We cannot exclude the

possibility of the existence of interaction effect among channels of diversification. In fact, very few BHCs expand their activities only through one channel in the era of deregulation, especially through M&A. When prior papers studied a specific diversification mode but do not control for other channels which may also affect BHCs performance, their empirical results may be biased. Therefore, integrated tests of the effects of various types of diversification and their interaction are essential for resolving these research issues and become the main framework of this study.

This study examines three broad traditional channels of diversification: geographic diversification, asset diversification and non-traditional banking activity diversification, and sub-divide them into six narrow sub-channels. First, geographic diversification is divided into domestic and international geographic diversification because opening a new branch in another city of its own country may have significantly less cost and risk compared to opening a new branch abroad. Moreover, the effects of portfolio diversification depend on the correlation between return distributions of individual securities which tends to be lower between- than within-countries. Therefore, the effects of diversification between domestic and international diversifications should be different. Second, because loans and securities are different assets with very different types of return and risk, asset diversification should be divided into loan diversification and security diversification. Third, this study adds off-balance-sheet activity diversification into analysis. Very few literatures examine the effect of off-balance-sheet diversification on BHCs performance. BHCs which engage in off-balance sheet activities may experience large returns but excessive risk. Thus, the effect of off-balance sheet diversification is still unknown and becomes another important issue. Therefore, non-traditional banking activity diversification is divided into non-interest-income diversification and off-balance-sheet diversification in this study.

Wagner (2006) shows that even though diversification could reduce financial

institutions' individual probability of failure, it makes systematic crises more likely. The result seems to be consistent with the 2007-2008 financial crises. The concern is that diversification may play different role before and during the financial crisis. Therefore, this study also examines the differences.

The results of this study may be useful for management since the specific activities and business strategies of small and large BHCs may differ, and hence the effects of diversification might also be different. Small BHCs face challenges to their survival in the market from competition of large BHCs. However, small BHCs usually concentrate on selected market segments, which give them a distinct comparative advantage, for example, in relationship lending (Mercieca, Schaeck and Wolfe, 2007). Contrary to small BHCs, large BHCs have difficulty in filtering "soft information". Thus, it is important to identify unique diversification strategies that make these BHCs successful. This study examines the effects of diversification for several groups of BHCs of different sizes to help identify the channels of diversification that BHCs can employ as tools to enhance their performance.

In conclusion, four issues are examined in this study: (1) Do all the channels of diversification have the same effects on BHCs performance? (2) Are there any interaction effects among these various types of diversification? (3) Do the effects of diversification during the financial crisis change? and (4) What impact does BHC size have upon diversification benefits and risks? This study examines the effects of multi-channel diversification on BHCs performance to answer these questions. Diversification effects are examined using both accounting and stock market measures of return and risk. Accounting measures of return contain return on asset (ROA), risk-adjusted return on asset (RAROA), return on equity (ROE) and risk-adjusted return on equity (RAROE). Market measures of return include stock return (SR) and risk-adjusted stock return (RASR). Accounting measures of risk are net charge-offs (NCO) for credit risk and

distance to default (Z score) for default risk. Market measures of risk contain maturity gap (MG), derivatives loss (DL), market beta (MB), interest rate beta (IRB), and value at risk (VaR). An integrated multiple regression model is estimated using panel data from 1996 to 2008 for BHCs of a wide range of sizes.

### **1.3 Contribution of the Dissertation**

This study contributes to the empirical literature regarding the impact of diversification on BHCs performance. A wider range of diversification is examined in this study compared to prior research. International geographic diversification is separated from domestic geographic diversification; security portfolio diversification is separated from loan diversification; off-balance-sheet diversification is separated from non-interest-income diversification. In addition, the effects of alternative channels of diversification are simultaneously tested in an integrated model, rather than in separate models as most previous work has done. These allow for a more comprehensive investigation and decrease the possibility of biased results.

Multi-diversification activities are popularly employed by BHCs and expected to have impact on their performance. However, interaction effects of diversifications are usually ignored in the literature. This study also examines them in the model.

This study examines the effect of diversification for BHCs of different sizes. This is important because there are differences among the policies and strategies of BHCs of various sizes. Most prior papers ignore these differences. This increases possibility of biased explanation for their testing results.

Furthermore, because of the huge impact of the financial crisis 2007-2008 on the banking industry and the high degree of market intervention of the U.S. government, the relationship between diversification and BHCs performance might also be biased if the



data of 1996 to 2008 are polled to estimate the empirical model. Thus, this study breaks the data into two groups, before and during the crisis— to once again prevent biased results.

## **1.4 Organization of the Dissertation**

The paper is organized as follows. Chapter II reviews the related literature; Chapter III develops the hypothesis; Chapter IV describes the model; Chapter V describes the variables and data; Chapter VI presents the empirical results; and Chapter VII concludes.

## **CHAPTER II**

### **LITERATURE REVIEW**

While many studies have addressed the issue of the financial benefits and risk associated with BHCs diversification, the results are still mixed. The literature for non-traditional bank activity diversification is much more extensive than the literature for geographic and asset diversifications. The literature is divided into three groups in terms of the types of diversification as follows:

#### **2.1 Geographic Diversification**

Morgan and Samolyk (2003) examine geographic diversification and find that diversification is not associated with greater returns (ROE or ROA) or risk reduction. Deng and Elyasiani (2005a) find that geographic diversification of BHCs is associated with a significant decline in equity risk.

#### **2.2 Asset Diversification**

Acharya et al. (2002) study loan portfolio diversity and show that diversification of loans does not typically improve performance or reduce risk in Italian banks. Deng and

Elyasiani (2005b) find that diversification of assets is associated with a significant decline in bank earning volatility.

### **2.3 Non-traditional Bank Activity Diversification**

Templeton and Severiens (1992) examine 54 BHCs from 1979 to 1986 and find that diversification, measured by the share of market value not attributed to bank assets is associated with lower variance of shareholder returns. Saunders and Walter (1994) review 18 studies that examine whether non-bank activities reduce BHC risk and report a widespread lack of consensus. For example, nine studies found reduced risk, six studies reported no reduction in risk, while three studies gave mixed results. Bhargava and Fraser (1998) examine stock returns of commercial banks around four Federal Reserve Board decisions to allow BHCs to engage in investment banking through Section 20 subsidiaries. They find that commercial banks experience positive abnormal stock returns when the Federal Reserve initially allowed banks to engage in investment underwriting activities, but negative abnormal returns as the Federal Reserve expands banks' abilities to underwrite corporate debt and equity. Kwan (1998) examines the returns of banks' Section 20 subsidiaries and their commercial bank affiliates and finds that Section 20 subsidiaries are typically more risky and not necessarily more profitable than their commercial bank affiliates. Allen and Jagtiani (1999) generate synthetic banks to simulate the impact of both insurance and securities activities and find that these nonbank activities reduce the firm's total risk but serve to increase systematic market risk. Whalen (1999a) examines the overseas insurance activities of US BHCs for the period from 1987 to 1997 and finds that mean returns in insurance activities significantly exceed the returns to banking as well as the returns on other nonbanking activities. Whalen (1999b) examines the foreign securities activities of US banks and finds that the

average security returns are similar to the returns of traditional banking activities, while measures of risk are somewhat higher. Cubo-Ottone and Murgia (2000) in a study of mergers and acquisitions in European banking find significant positive abnormal returns associated with product diversification of banks into insurance. However, they also find that M&A with securities firms and foreign institutions did not result in a gain.

Reichert and Wall (2000) form efficient portfolios of BHC with traditional activities (savings banks, savings and loan associations, personal, and business companies) and non-traditional activities (security brokers, commodity brokers/dealers, life insurance underwriters, insurance agents and brokers, investment companies, and developers) over three separate periods: a) pre-deregulation: 1974-1980, b) deregulation: 1981-1989, and c) post-deregulation: 1990-1997. Using both ROA and ROE as a measure of industry performance, the authors conclude that during the earlier two periods the benefits to bank diversification into nontraditional services were two-dimensional in that bank holding companies could achieve both a dramatic increase in expected return and a significant reduction in risk. Expansion into life insurance underwriting and regulated investment companies would have been particularly beneficial. On the other hand, during the later period (1990-1997) the benefits to diversification were limited to an increase in expected earnings with little or no risk reduction noticed. The authors conclude that while some consistent trends are evident over the entire 25 year period, the precise mix of return enhancing and/or risk reducing diversification is likely to vary over time.

The most recent studies generally conclude that bank expansion into less traditional financial activities is associated with increased risk and lower returns. For example, De Young and Roland (2001) find that a shift toward fee based activities is associated with increased revenue volatility and a higher degree of total leverage, both of which imply greater earnings volatility for commercial banks. Cornett et al. (2002) examine banks' Section 20 subsidiaries and find evidence that industry-adjusted operating cash flow

return on assets rises, while risk do not change significantly. Stiroh (2004) concludes that a greater reliance on non-interest income, particularly trading revenue, is associated with higher risk and lower risk-adjusted profits across commercial banks. Deng and Elyasiani (2005b) find that diversification of non-traditional activities is associated with a significant lower firm risk. Laeven and Levine (2005) find that, on average, diversity of activities by banks destroys value and reduces bank performance. Stiroh (2005) shows that increased exposure to non-interest income increases the volatility of equity market returns, but not the mean returns. Stiroh and Rumble (2006) find that risk-adjusted return is significantly and positively related to diversification of non-interest activities, but diversification of non-interest activities is associated with a significant increase in firm risk.

Reichert, Wall, and Liang (2008) analyze the merits of allowing affiliation between bank holding companies and commercial firms during the 1994-2004 period. The paper examines the potential increase in return (or reduction in risk) from combining various industries into efficient portfolios. The paper finds potential gains to banking when diversification into the commercial sector is permitted and significant gains to the commercial sector when entering the banking sector. For example, when efficient portfolios were formed using 10 major industry categories, a BHC's historical average ROE of approximately 8.0% could be increased to 11% with no increase in risk by investing in a portfolio comprised of 15.4% of its assets in banking and the remaining shares invested in the following sectors: nonbank financial services (15.7%), retail (27.3%), wholesale (21.8%), and construction (11.7%).

## **2.4 Limitations of the Literature**

The literature clearly does not find consistent results. This may be due to model

specification error or data discrepancies. For example, in a model with assets as the only diversification channel we may find that asset diversification alone has a significant impact on performance. However, it may be incorrect to draw such a conclusion because asset and geographic diversification are often employed simultaneously. The data used to calculate asset diversification may also contain some information on geographic diversification. It becomes difficult to explain the effect of asset diversification without controlling for geographic diversification and their interaction effects. Therefore, a more comprehensive study is needed for the diversification and performance issues.

## **CHAPTER III**

### **HYPOTHESES**

#### **3.1 Individual Effects of Diversifications**

According to portfolio theory, BHCs might benefit from reduced portfolio risk through activity diversification if they diversified into activities with negative or low positively correlated returns. It is expected that the more diversified portfolio can create greater return, reduced risk, and greater risk-adjusted return. Therefore,

H1a: Broadly diversified BHCs will have greater returns, lower levels of risk, and greater risk-adjusted returns.

According to agency theory, when BHCs diversify their activities, they may incur more serious agency problems or exposure to more volatile activities which may not be necessarily more profitable. Therefore, the benefits of diversification may be offset by their costs. More diversified portfolios will result in lower returns, greater risks, or lower risk-adjusted returns. Therefore,

H1b: Broadly diversified BHCs will have lower returns, greater levels of risk, or lower risk-adjusted returns.

### **3.2 Interaction Effects of Diversifications**

This study examines four interaction effects of diversifications. First, BHCs that simultaneously engage in geographic and loan diversifications may have positive interaction effects on their performance because BHCs can provide more exact services to fulfill specific needs of their target customers in different areas. Operating costs can be lowered because of the economies of scale and scope. Second, BHCs may also take this advantage by engaging in both geographic and non-interest-income diversifications. Third, off-balance-sheet activities are usually used as tools to hedge risk of security portfolios. Therefore, the interaction of security and off-balance-sheet diversifications should reduce risk and lead to an increase in risk-adjusted returns. Finally, large BHCs are more capable of well diversifying their portfolios to enhance their market power and reduce risk. Therefore, the interaction of all-activity diversifications should be negatively related to risk and positively related to return and risk-adjusted return. Therefore,

H2a: Interactions of diversifications are expected to increase returns, reduce risk and increase risk-adjusted returns.

However, the benefits of economies of scale and scope might be totally offset by agency costs. When BHCs are not efficiently managed, diversifying to multi-channel activities may reduce returns, increase risk and reduce risk-adjusted returns. Therefore,

H2b: Interactions of diversifications are expected to reduce returns, increase risk and reduce risk-adjusted returns.



## **CHAPTER IV**

### **EMPIRICAL MODEL**

The purpose of this study is to investigate the link between diversifications of BHCs and performance. Activity diversification has become one of the important strategies that BHCs expand their business. BHCs usually diversify activities through multi-channels. The impact of individual diversification and their interaction effects are the major focus in this study. All measures of diversifications and interactions are integrated into a panel regression. This provides an opportunity to examine the whole phase of BHC diversification of activities rather than partial one. Three issues are examined in the model. First, the effect of individual diversification tells us whether diversity can improve performance. Second, the interaction effect of individual diversification and its underlying activity exposure tells us whether diversification with greater exposure is associated with higher performance. Third, the interaction effect of diversifications tells us whether multi-channel diversification can improve performance. Panel data give more information on variations within BHCs and time exposure. To resolve autocorrelation problems on residual, a panel regression with first-order autoregressive scheme, AR(1) is as follows and estimated by using quarterly data across recent ten-year period (1998 Q4 – 2008 Q4). In addition, to resolve heteroskedasticity problems on residual, the White

Heteroskedasticity-Consistent Standard Errors are used to calculate the t-statistics.

$$\text{Performance}_{i,t} = \alpha + \beta \text{DIV}_{i,t} + \gamma \text{SDIV}_{i,t} + \lambda \text{IDIV}_{i,t} + \delta \text{C}_{i,t} + u_{i,t}$$

$$u_{i,t} = \rho u_{i,t-1} + \varepsilon_{i,t}$$

Where  $i$  is the  $i^{\text{th}}$  BHC.  $t$  is the observed quarter. Performance is a measure of performance. DIV is a vector of diversification index including domestic geographic diversification ( $\text{DIV}_{\text{DG}}$ ), loan diversification ( $\text{DIV}_{\text{L}}$ ), security diversification ( $\text{DIV}_{\text{S}}$ ), non-interest-income diversification ( $\text{DIV}_{\text{NII}}$ ) and off-balance-sheet diversification ( $\text{DIV}_{\text{OBS}}$ ). SDIV is a vector of scale interaction of diversification to measure the interaction of diversification level and its underlying activity exposure. Because effects of diversifications could be positive or negative, the SDIV effects are not known. IDIV is a vector of interaction of diversifications including interaction of geographic and loan diversifications, interaction of geographic and non-interest-income diversifications, interaction of security and off-balance-sheet diversifications, and interaction of all activities.

C is a vector of control variables. Cross-border loan exposure to asset ratio (S1), domestic deposit to asset ratio (S2), loan to asset ratio (S3), security to asset ratio (S4), non-interest-income to asset ratio (S5) and off-balance-sheet to asset ratio (S6) are used to control for the size effect of activities. Risk spreads to the world due to international investment activities. International BHCs have advantages of diversifying their portfolios worldwide to search for investment opportunity of higher returns and lower risk. Cross-border exposure ratio is expected to be positively related to returns, negatively to risk and positively to risk-adjusted returns. Deposits provide BHCs with fund to expand

the levels of portfolios. High level of deposits should increase BHCs' returns and reduce risk. Loans, securities and non-interest incomes are the major sources of income for BHCs. Greater amount of them should provide BHCs with higher returns. However, BHCs might expand to products with low or high risk. Therefore, it could be possible to induce lower or higher levels of portfolio risk. Off-balance-sheet activities might incur huge amount of returns or losses. Therefore, the levels of off-balance-sheet ratio could be positively or negatively related to returns and risk. The log of total assets (C1) is used to control for any systematic differences in performance across size classes. Because larger BHCs have competitive advantage to smaller BHCs, the size factor is expected to be negatively related to returns and risk. However, it is also possible that larger BHCs may take more risky activities than smaller BHCs, and, thus, size is expected to be positively related to returns and risk. The equity to asset ratio (C2) may affect performance because risk-loving BHCs may hold less equity. Therefore, equity ratio is expected to be negatively related to return and risk. However, it is also possible that loan holders intensively monitor BHCs activities when BHCs have higher leverage ratio. It is expected that equity ratio is positively related to return and risk. The quarterly asset growth (C3) may affect performance because risk-loving BHCs may grow more rapidly. It is expected that asset growth is positively related to returns and risk and negatively to risk-adjusted returns. Merger dummy (C4) is used to control for mergers. Mergers may be negatively or positively related to BHC performance. C4\*C3 controls for the size of merger. Moreover, a dummy variable for each year during the observing period is used to control for the economic environment in that year.

$u_{i,t}$  is the disturbance.  $\rho$  is the coefficient of autocovariance.  $\varepsilon_{i,t}$  is the stochastic disturbance term which satisfies the standard OLS assumption.

The estimated  $\hat{\beta}$  measures the impact of individual diversification on performance

where  $\hat{\beta} > 0$  if diversification is associated with improved performance.  $\hat{\gamma}$  measures the interaction effect of diversification and activity exposure where  $\hat{\gamma} > 0$  indicates that diversification with greater exposure is associated with higher performance.  $\hat{\lambda}$  measures the interaction impact of diversifications where  $\hat{\lambda} > 0$  indicates that multi-channel diversification is associated with improved performance.

To compare the impacts of diversifications among BHCs of different sizes, the panel regression is also estimated by sub-groups of BHCs. BHCs are divided into four groups based on their total asset at the last quarter of 2008: small BHCs with total asset less than \$1 billion, larger community BHCs with total asset between \$1 billion and \$25 billion, regional BHCs with total asset between \$25 billion and \$150 billion, money center BHCs with total asset greater than \$150 billion. Moreover, some BHCs are international BHCs with activities overseas. The regression is also estimated for international BHCs with the measure of international geographic diversification (IGD).

To compare the impacts of diversifications between before and during the financial crisis 2007-2008, the regression is estimated for the sub-periods.

## **CHAPTER V**

### **DATA AND VARIABLES**

#### **5.1 Sample**

The observing sample is U.S. BHCs consistently filing quarterly FR Y-9C reports to the Federal Reserve Bank from 1996 Q1 to 2008 Q4. The total number of the sample BHCs is 442. The observing period is long enough to cover at least a whole economic circle to prevent any economic cycle bias. During the observing period, failed or merged BHCs are excluded from the sample because their domestic deposit data which are used to measure domestic geographic diversification are not provided by the Federal Deposit Insurance Corporation (FDIC). This is expected to have little survivorship bias. For failed BHCs, although the exact number of failed BHCs is not recorded by the Federal Reserve Bank, it is expected that very few BHCs liquidate to bankruptcy. Before bankruptcy, BHCs are usually merged by other BHCs. For merged BHCs, the critical factor which affects BHC merger is not only bad performance. Besides efficiency improvement, there are several other reasons for a BHC to acquire another BHC (operating synergy, financial synergy, the hubris, agency problems etc.) A BHC with good performance is also possible to be merged. Therefore, without including failed or merged BHCs in the sample should not incur serious result bias.

Of the 442 sample BHCs, 184 are small BHCs, 239 are larger community BHCs, 10 are regional BHCs and 9 are money center BHCs. Of the 442 sample BHCs, 119 are publicly traded BHCs (30 small BHCs, 70 larger community BHCs, 10 regional BHCs and 9 money center BHCs). Of the 442 sample BHCs, 6 are international BHCs reporting foreign loan exposures (JPMORGAN CHASE & CO, CITYGROUP, INC., BANK OF AMERICA CORPORATION, STATE STREET CORPORATION, COMERICA INCORPORATED and BANK OF HAWAII CORPORATION).

## **5.2 Data Sources**

Accounting data used to calculate the dependent variables, diversification indices and control variables are from BHCs' annual reports and FR Y-9C reports in the Bank Holding Company database of Federal Reserve Bank of Chicago. Domestic state-based deposits of BHCs which are used for calculating domestic geographic diversification index are from the Federal Deposit Insurance Corporation's (FDIC) Summary of Deposits (SOD) database. Because cross-border deposits are not available in SOD or BHCs' annual reports, diversification index based on cross-border loan exposure are used to proxy for international geographic diversification index. The data are from BHCs' 10-K reports. Value at risk (VaR) are from BHCs' 10-K reports.

Market stock prices, stock returns and S&P500 index returns are from the Center for Research in Security Prices (CRSP) database. 10-year Treasury rate is from the Federal Reserve Bank of St. Louis database.

## **5.3 Variables**

All the variables incorporated into the regression model are in quarterly basis. The definitions of independent and dependent variables incorporated in the regression model

are as follows:

### 1. Activity diversification

To measure the diversifications of a BHC's activities, this study follows the Herfindahl-Hirschman index approach used in Stir and Rumble (2006) and Deng, Elyasiani and Mao (2006). Herfindahl-Hirschman index ranges between zero and one, and increases with the degree of diversification. BHCs activity diversifications are divided into six groups: International geographic diversification, Domestic geographic diversification, Loan diversification, Security diversification, Non-interest-income diversification, and off-balance-sheet diversification. A Herfindahl-Hirschman index will be created to proxy for each of them. Detailed definitions of variables used to for calculating each diversification index are listed in table 1.

The individual measures of diversification are defined as follows.

(1) International geographic diversification index ( $DIV_{IG}$ ):

$$DIV_{IG} = 1 - \sum_j \left( \frac{\text{Cross - border Loan Exposure}_j}{\sum_j \text{Cross - border Loan Exposure}_j} \right)^2 \quad j = 1, 2, \dots$$

Cross-border Loan Exposure<sub>j</sub> is total loan exposure for the BHC in the j<sup>th</sup> foreign country and  $\sum_j (\text{Cross - border Loan Exposure})_j$  is the sum of loan exposure over all of the foreign countries. The total loan exposure includes total cross-border asset outstanding and commitments.

**Table 1: Variables Used for Calculating Diversification Indices**

\*\*\* In the parentheses are data sources or variable codes in FR Y9-C.

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( I ) International geographic diversification ( $DIV_{IG}$ ):

Total cross-border loan exposure (10-K)

---

( II ) Domestic geographic diversification ( $DIV_{DG}$ ):

Deposit in each state of the U.S. (SOD)

---

( III ) Loan diversification ( $DIV_L$ ):

1. Loans secured by real estate (BHCK1410)
  2. Loans to depository institutions and acceptances of other banks (BHDM1288)
  3. Loans to finance agricultural production and other loans to farmers (BHCK1590)
  4. Commercial and industrial loans (BHDM1766)
  5. Loans to individuals for household, family, and other personal expenditures (BHDM1975)
  6. Loans to foreign governments and official institutions (BHCK2081)
  7. Loans for purchasing and carrying securities (BHCK1545)
  8. All other loans (BHCK1564)
  9. Lease financing receivables (BHDM2165)
- 

( IV ) Security diversification ( $DIV_S$ ):

1. U.S. Treasury securities (BHCK0211 + BHCK1287)
2. U.S. government agency obligations (BHCK1289 + BHCK1294 + BHCK1293 + BHCK1298)
3. Securities issued by states and political subdivisions in the U.S. (BHCK8496 + BHCK8499)
4. Mortgage-backed securities (BHCK1698 + BHCK1703 + BHCK1709 + BHCK1714 + BHCK1718 +  
BHCK1733 + BHCK1702 + BHCK1707 + BHCK1713 + BHCK1717 + BHCK1732 + BHCK1736)
5. Asset-backed securities (BHCKC026 + BHCKC027)
6. Other debt securities (BHCK1737 + BHCK1742 + BHCK1741 + BHCK1746)
7. Investments in mutual funds and other equity securities with readily determinable fair values  
(BHCKA511)



**Table 1 (Continued)**

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( V ) Non-interest income diversification ( $DIV_{NII}$ ):

1. Income from fiduciary activities (BHCK4070)
  2. Service charges on deposit accounts in domestic offices (BHCK4483)
  3. Trading revenue (BHCKA220)
  4. Fees and commissions from securities brokerage (BHCKC886)
  5. Investment banking, advisory, and underwriting fees and commissions (BHCKC888)
  6. Fees and commissions from annuity sales (BHCKC887)
  7. Underwriting income from insurance and reinsurance activities (BHCKC386)
  8. Income from other insurance activities (BHCKC387)
  9. Venture capital revenue (BHCKB491)
  10. Net servicing fees (BHCKB492)
  11. Net securitization income (BHCKB493)
  12. Other noninterest income (BHCKB497)
- 

( VI ) Off-balance-sheet diversification ( $DIV_{OBS}$ ):

1. Unused commitments (BHCK3814 + BHCK3815 + BHCK3816 + BHCK6550 + BHCK3817 + BHCK3818)
2. Financial standby letters of credit and foreign office guarantees (BHCK6566)
3. Performance standby letters of credit and foreign office guarantees (BHCK6570)
4. Commercial and similar letters of credit (BHCK3411)
5. Securities lent (BHCK3433)
6. Credit derivatives (guarantor) (BHCKC968 + BHCKC970 + BHCKC927 + BHCKC974)
7. Credit derivatives (beneficiary) (BHCKC969 + BHCKC971 + BHCKC973 + BHCKC975)
8. Spot foreign exchange contracts (BHCK8765)
9. All other off-balance-sheet items (exclude derivatives) (BHCK3430)
10. Future contracts (BHCK8693 + BHCK8694 + BHCK8695 + BHCK8696)
11. Forward contracts (BHCK8697 + BHCK8698 + BHCK8699 + BHCK8700)
12. Written exchange-traded options (BHCK8701 + BHCK8702 + BHCK8703 + BHCK8704)
13. Purchased exchange-traded options (BHCK8705 + BHCK8706 + BHCK8707 + BHCK8708)
14. Written over-the-counter options (BHCK8709 + BHCK8710 + BHCK8711 + BHCK8712)
15. Purchased over-the-counter options (BHCK8713 + BHCK8714 + BHCK8715 + BHCK8716)
16. Swaps (BHCK3450 + BHCK3826 + BHCK8719 + BHCK8720)

(2) Domestic geographic diversification index ( $DIV_{DG}$ ):

$$DIV_{DG} = 1 - \sum_j \left( \frac{Deposit_j}{\sum_j Deposit_j} \right)^2 \quad j = 1, 2, \dots$$

$Deposit_j$  is deposit in the  $j^{th}$  state of the U.S. and  $\sum_j Deposit_j$  is the sum of deposits over all of the states.

FDIC reports only annual deposit data before 2002 and, thus, annual domestic geographic diversification indices are calculated during this period. Therefore, linear interpolation method is used to calculate quarterly domestic geographic diversification indices between 1998 Q4 and 2001 Q4.

(3) Loan diversification index ( $DIV_L$ ):

$$DIV_L = 1 - \sum_j \left( \frac{Loan_j}{\sum_j Loan_j} \right)^2 \quad j = 1, 2, \dots$$

$Loan_j$  is the exposure of loan category  $j$  and  $\sum_j Loan_j$  is the total exposure of loans which is the sum of loans to different economic sectors such as commercial and industrial, real estate, agriculture, financial institutions, individuals, and others.

(4) Security diversification index ( $DIV_s$ ):

$$DIV_s = 1 - \sum_j \left( \frac{Security_j}{\sum_j Security_j} \right)^2 \quad j = 1, 2, \dots$$

$Security_j$  is the exposure of security category  $j$  and  $\sum_j Security_j$  is the total exposure of securities which is the sum of securities traded such as U.S. treasury

securities, mortgage-backed securities, asset-backed securities, and other investments.

(5) Non-interest-income diversification index ( $DIV_{NII}$ ):

$$DIV_{NII} = 1 - \sum_j \left( \frac{Income_j}{\sum_j Income_j} \right)^2 \quad j = 1, 2, \dots$$

$Income_j$  is the exposure of non-interest-income activity category  $j$  and  $\sum_j Income_j$  is the total exposure of non-interest-income activities which is the sum of non-interest incomes such as fiduciary income, service charges, trading revenue, foreign exchange transaction income, and other non-interest income.

(6) Off-balance-sheet diversification index ( $DIV_{OBS}$ ):

$$DIV_{OBS} = 1 - \sum_j \left( \frac{Off_j}{\sum_j Off_j} \right)^2 \quad j = 1, 2, \dots$$

$Off_j$  is the exposure of off-balance sheet activity category  $j$  and  $\sum_j Off_j$  is the total exposure of off-balance sheet activities which is the sum of notional amounts of off-balance-sheet activities such as unused commitments, financial standby letters of credit and foreign office guarantees, credit derivatives, future contracts, forward contracts, options, swap contracts and other off-balance-sheet activities.

## 2. Scale Variables

Scale variables include cross-border loan exposure ratio S1 (Total cross-border loan exposure / Total asset), Deposit ratio S2 (Total domestic deposit / Total asset), Loan ratio

S3 (Total loan exposure / Total asset), Security ratio S4 (Total security exposure / Total asset), Non-interest-income ratio S5 (Total non-interest income / Total asset), and Off-balance-sheet ratio S6 (Total off-balance-sheet exposure / Total asset). These ratios are used to control for the size effects of activities.

### 3. Scale interaction of diversification

The scale interactions of diversification are defined as the product of specified diversification index and the exposure ratio of its underlying activity. They are  $DIV_{IG} * S1$ ,  $DIV_{DG} * S2$ ,  $DIV_L * S3$ ,  $DIV_S * S4$ ,  $DIV_{NI} * S5$  and  $DIV_{OBS} * S6$ .

### 4. Activity interaction

The measures of interaction of diversifications are defined as the product of the specified diversification indices. For example, the measure of interaction between international geographic and loan diversifications ( $DIV_{IG,L}$ ) is calculated as follows:

$$DIV_{IG,L} = DIV_{IG} * DIV_L$$

### 5. Control variables

$C_1$ : Log of total asset

$C_2$ : Equity to assets ratio

$C_3$ : Quarterly growth of asset

$C_4$ : Dummy variable with value 1 if the BHC engages in M&A in that quarter, otherwise 0.

$C_4 * C_3$ : Interaction of merger and asset growth

Y99 – Y08: Dummy variables for each year during the observing period of 1998 - 2008

## 6. Measures of BHC performance

To sufficiently get insight into the effects of diversifications, both accounting and market performances are measured as dependent variables in this study. They contain accounting returns, market returns, credit risk, market risk and default risk.

### (1) Accounting returns:

Several measures of accounting returns are calculated as BHC performance variables, including return on asset (ROA), risk-adjusted return on asset (RAROA), return on equity (ROE) and risk-adjusted return on equity (RAROE). The definitions of RAROA and RAROE are

$$RAROA_{i,t} = \frac{ROA_{i,t}}{\sigma_{ROA_{i,t}}}$$

$$RAROE_{i,t} = \frac{ROE_{i,t}}{\sigma_{ROE_{i,t}}}$$

The rolling standard deviations of ROA and ROE for BHC  $i$  at time  $t$  ( $\sigma_{ROA_{i,t}}$  and  $\sigma_{ROE_{i,t}}$ ) are calculated by using three-year quarterly ROAs and ROEs before time  $t$ .

### (2) Market returns:

Market returns are measured as BHC performance including stock return with dividends (SR) and risk-adjusted stock return with dividends (RASR).

$$RASR_{i,t} = \frac{SR_{i,t}}{\sigma_{SR_{i,t}}}$$

$\sigma_{SR_{i,t}}$  is a rolling standard deviation of SR calculated by using three-year quarterly SRs before time t.

### (3) Credit risk:

Credit risk arises from the fact that counterparties may be unwilling or unable to fulfill their contractual obligations. It is measured by the cost of replacing cash flows if the other party defaults. Net charge-offs are calculated to measure credit risk of BHCs. Net charge-off is defined as the absolute value of difference between total charge-off and total recovery (FR Y-9C: BHCK4635, BHCK4605, respectively). Net charge-off ratio (Net charge-off / Total asset) is used as one of the BHC performance variables in the regression model.

### (4) Market risk

Market risk arises from movements in the level or volatility of market prices. It is the danger of changing market values of bank assets, liabilities and equity that may bring about loss. Several measures of market risk are calculated, including maturity gap, derivatives loss, market beta, interest rate beta and VaR.

Shifting interest rates may adversely affect a BHC's net income. Maturity gap is used to measure such interest rate risk and defined as the difference between earning assets that are repriceable within one year or mature within one year and the sum of interest-bearing deposit liabilities that reprice within one year or mature within one year and long-term debt that reprices within one year (FR Y-9C: BHCK3197 – BHCK3296 – BHCK3298). Maturity gap ratio (Maturity gap / Total asset) is used as one of the BHC performance variables in the regression model.

Derivatives are instruments designed to manage financial risks. Its value is derived from some underlying asset price, reference rate, or index. Therefore, derivatives loss can be used as a measure of market risk. Derivatives losses are obtained from FR Y-9C (BHCKA251). Derivatives loss ratio (Derivatives loss / Total asset) is used as one of the BHC performance variables in the regression model.

Market beta and interest rate beta are measures of exposure to market price and interest rate movements, respectively. They both are usually used as measures of market risk. Rolling market beta and interest rate beta are used as ones of the BHC performance variables in the regression model and estimated from the following market model by using daily BHCs stock returns without dividends, S&P500 index returns without dividends and 10-year treasury rates over three-year period before current time.

$$SR_{i,t} = \alpha + \beta_{m,i} R_{m,t} + \beta_{r,i} R_{r,t} + \varepsilon_t$$

$SR_{i,t}$  is stock return without dividend for BHC  $i$  at time  $t$ .  $R_{m,t}$  is S&P500 index return without dividend.  $R_{r,t}$  is 10-year Treasury rate. The coefficients  $\hat{\beta}_{m,i}$  and  $\hat{\beta}_{r,i}$  are the estimated market beta and interest rate beta for BHC  $i$ , respectively.

Value at risk (VaR) measures an aggregate view of a portfolio's risk. It summarizes the worst loss over a target horizon with a given level of confidence. VaR has being used to control and manage BHCs' market risk. The VaR which is obtained from BHCs' annual reports are average annual data. Therefore, the VaR is treated as the value at the center of each year. Quarterly VaRs are calculated by linear interpolation method between consecutive annual VaRs. The final

available quarterly VaR data for the regression model are from 1998 Q4 to 2008 Q2. VaR ratio (VaR / Total asset) is used as one of the BHC performance variables in the regression model.

(5) Default risk

Distance to default (Z-score) is used as one of the BHC performance variables in the regression model. Following Stir and Rumble (2006), z-score measures the number of standard deviation that profits must fall to drive the BHC into insolvency. The larger the Z-score, the less default risky for BHCs. The Z score for BHC i at time t is defined as follows:

$$Z_{i,t} = \frac{ROA_{i,t} + E/A_{i,t}}{\sigma_{ROA_{i,t}}}$$

$ROA_{i,t}$  is return on asset.  $E/A_{i,t}$  is equity to total asset ratio.  $\sigma_{ROA_{i,t}}$  is rolling standard deviations of ROA.

## 5.4 Descriptive Statistics

Table 2 – 7 present summary statistics of performance and diversification measures for sub-groups and all sample BHCs across the whole observing period (1998 Q4 – 2008 Q4).

1. Accounting returns:

(1) ROA and RAROA - For small BHCs, the mean return on asset (ROA) is 0.0027, with standard deviation of 0.0021 and mean risk-adjusted return on asset (RAROA) of 6.4105. For larger community BHCs, the mean ROA is



0.0029, with standard deviation of 0.0047 and mean RAROA of 7.5221. For regional BHCs, the mean ROA is 0.0025, with standard deviation of 0.0031 and mean RAROA of 6.8614. For money center BHCs, the mean ROA is 0.0032, with standard deviation of 0.0017 and mean RAROA of 7.4152. For international BHCs, the mean ROA is 0.0028, with standard deviation of 0.0016 and mean RAROA of 5.0667. For all BHCs, the mean ROA is 0.0028, with standard deviation of 0.0037 and mean RAROA of 7.0422.

Money center BHCs have the best performance with the largest mean ROA, small standard deviation on ROA and high RAROA. Regional BHCs have the worst performance on ROA and international BHCs have the worst performance on RAROA.

- (2) ROE and RAROE - For small BHCs, the mean return on equity (ROE) is 0.0292, with standard deviation of 0.0323 and mean risk-adjusted return on equity (RAROE) of 6.3942. For larger community BHCs, the mean ROE is 0.0308, with standard deviation of 0.0417 and mean RAROE of 7.4609. For regional BHCs, the mean ROE is 0.0305, with standard deviation of 0.0444 and mean RAROE of 7.2680. For money center BHCs, the mean ROE is 0.0383, with standard deviation of 0.0211 and mean RAROE of 7.4225. For international BHCs, the mean ROE is 0.0376, with standard deviation of 0.0229 and mean RAROE of 5.1609. For all BHCs, the mean ROE is 0.0303, with standard deviation of 0.0378 and mean RAROE of 7.0117.

Money center BHCs still have the best performance with the largest mean ROE, smallest standard deviation on ROE and high RAROE. Small BHCs have the worst performance on ROE. International BHCs have the worst performance on RAROE.

2. Market returns:

For small BHCs, the mean stock return (SR) is 0.0110, with standard deviation of 0.1522 and mean risk-adjusted stock return (RASR) of 0.0849. For larger community BHCs, the mean SR is 0.0196, with standard deviation of 0.1552 and mean RASR of 0.1544. For regional BHCs, the mean SR is 0.0039, with standard deviation of 0.1651 and mean RASR of 0.0180. For money center BHCs, the mean SR is 0.0166, with standard deviation of 0.1556 and mean RASR of 0.1293. For international BHCs, the mean SR is 0.0177, with standard deviation of 0.1636 and mean RASR of 0.1170. For all BHCs, the mean SR is 0.0159, with standard deviation of 0.1554 and mean RASR of 0.1235.

Larger community BHCs have the best performance with the largest mean SR, small standard deviation on SR and the highest RASR. Regional BHCs have the worst performance on SR and RASR.

3. Credit risk:

For small BHCs, the mean net charge-offs (NCO) is 0.0004, with standard deviation of 0.0012. For larger community BHCs, the mean NCO is 0.0007, with standard deviation of 0.0025. For regional BHCs, the mean NCO is 0.0009, with standard deviation of 0.0015. For money center BHCs, the mean NCO is 0.0010, with standard deviation of 0.0009. For international BHCs, the mean NCO is 0.0009, with standard deviation of 0.0008. For all BHCs, the mean NCO is 0.0006, with standard deviation of 0.0020.

Small BHCs have the lowest credit risk with the lowest net charge-offs. Money center BHCs have the highest credit risk. The results show that the larger the

BHCs, the higher the credit risk.

4. Market risk:

(1) Maturity gap (MG) - For small BHCs, the mean MG is 0.1414, with standard deviation of 0.1142. For larger community BHCs, the mean MG is 0.1577, with standard deviation of 0.1326. For regional BHCs, the mean MG is 0.2380, with standard deviation of 0.1090. For money center BHCs, the mean MG is 0.2101, with standard deviation of 0.0974. For international BHCs, the mean MG is 0.1934, with standard deviation of 0.1020. For all BHCs, the mean MG is 0.1538, with standard deviation of 0.1253.

Small BHCs have the lowest interest rate risk with the lowest maturity gap.

Regional BHCs have the highest interest rate risk.

(2) Derivatives loss (DL) - Mean derivatives losses are not significantly different for all BHC groups. Larger community BHCs report a largest range of DL from -0.0085 to 0.0097. The other groups have similarly small standard deviations of DL.

(3) Market beta (MB) - For small BHCs, the mean MB is 0.3892, with standard deviation of 0.4661. For larger community BHCs, the mean MB is 0.7663, with standard deviation of 0.4751. For regional BHCs, the mean MB is 0.9230, with standard deviation of 0.2826. For money center BHCs, the mean MB is 1.1186, with standard deviation of 0.2512. For international BHCs, the mean MB is 1.1504, with standard deviation of 0.2926. For all BHCs, the mean MB is 0.7111, with standard deviation of 0.4932.

The results show that the larger the BHCs, the higher the market risk they have.

(4) Interest rate beta (IRB) - For small BHCs, the mean IRB is -0.0062, with

standard deviation of 0.1516. For larger community BHCs, the mean IRB is -0.0082, with standard deviation of 0.1543. For regional BHCs, the mean IRB is 0.0002, with standard deviation of 0.1271. For money center BHCs, the mean IRB is 0.0012, with standard deviation of 0.1166. For international BHCs, the mean IRB is -0.0055, with standard deviation of 0.1243. For all BHCs, the mean IRB is -0.0063, with standard deviation of 0.1501.

The results show that money center BHCs have the largest interest rate risk.

(5) VaR – Only 8 money center BHCs report VaR. The mean VaR is 0.0001.

5. Default risk:

For small BHCs, the mean Z-score is 215.1264, with standard deviation of 161.1679. For larger community BHCs, the mean Z-score is 234.6115, with standard deviation of 174.4938. For regional BHCs, the mean Z-score is 189.2316, with standard deviation of 170.6882. For money center BHCs, the mean Z-score is 186.0960, with standard deviation of 178.5651. For international BHCs, the mean Z-score is 126.9590, with standard deviation of 79.0468. For all BHCs, the mean Z-score is 224.4855, with standard deviation of 169.5014.

The results show that larger community BHCs have the lowest default risk, while international BHCs and money center BHCs have the highest default risk.

6. Diversifications:

(1) International geographic diversification ( $DIV_{IG}$ ) – International BHCs have mean  $DIV_{IG}$  of 0.6410 and a range of  $DIV_{IG}$  from 0 to 0.9136.

(2) Domestic geographic diversification ( $DIV_{DG}$ ) - For small BHCs, the mean  $DIV_{DG}$  is 0.0198, with standard deviation of 0.0930. For larger community BHCs, the mean  $DIV_{DG}$  is 0.0703, with standard deviation of 0.1597. For regional BHCs, the mean  $DIV_{DG}$  is 0.2519, with standard deviation of 0.2897. For money center BHCs, the mean  $DIV_{DG}$  is 0.1937, with standard deviation of 0.2364. For international BHCs, the mean  $DIV_{DG}$  is 0.1647, with standard deviation of 0.1995. For all BHCs, the mean  $DIV_{DG}$  is 0.0559, with standard deviation of 0.1494.

Regional BHCs have the largest level of domestic geographic diversification, while small BHCs have the smallest one.

(3) Loan diversification ( $DIV_L$ ) - For small BHCs, the mean  $DIV_L$  is 0.4202, with standard deviation of 0.1470. For larger community BHCs, the mean  $DIV_L$  is 0.4456, with standard deviation of 0.1428. For regional BHCs, the mean  $DIV_L$  is 0.4748, with standard deviation of 0.2074. For money center BHCs, the mean  $DIV_L$  is 0.5755, with standard deviation of 0.1281. For international BHCs, the mean  $DIV_L$  is 0.5466, with standard deviation of 0.1408. For all BHCs, the mean  $DIV_L$  is 0.4383, with standard deviation of 0.1480.

The results show that the larger the BHCs, the higher level of loan diversification they have.

(4) Security diversification ( $DIV_s$ ) - For small BHCs, the mean  $DIV_s$  is 0.4139, with standard deviation of 0.2626. For larger community BHCs, the mean  $DIV_s$  is 0.4585, with standard deviation of 0.2243. For regional BHCs, the

mean  $DIV_s$  is 0.3482, with standard deviation of 0.2132. For money center BHCs, the mean  $DIV_s$  is 0.4710, with standard deviation of 0.1662. For international BHCs, the mean  $DIV_s$  is 0.4179, with standard deviation of 0.2264. For all BHCs, the mean  $DIV_s$  is 0.4377, with standard deviation of 0.2412.

Money center BHCs have the largest level of security diversification, while regional BHCs have the smallest one.

(5) Non-interest-income diversification ( $DIV_{NII}$ ) - For small BHCs, the mean  $DIV_{NII}$  is 0.4656, with standard deviation of 0.2090. For larger community BHCs, the mean  $DIV_{NII}$  is 0.4937, with standard deviation of 0.2019. For regional BHCs, the mean  $DIV_{NII}$  is 0.5727, with standard deviation of 0.1831. For money center BHCs, the mean  $DIV_{NII}$  is 0.6550, with standard deviation of 0.1616. For international BHCs, the mean  $DIV_{NII}$  is 0.6397, with standard deviation of 0.1678. For all BHCs, the mean  $DIV_{NII}$  is 0.4871, with standard deviation of 0.2061.

The results show that the larger the BHCs, the higher level of non-interest-income diversification they have.

Off-balance-sheet diversification ( $DIV_{OBS}$ ) - For small BHCs, the mean  $DIV_{OBS}$  is 0.1350, with standard deviation of 0.1533. For larger community BHCs, the mean  $DIV_{OBS}$  is 0.1838, with standard deviation of 0.1839. For regional BHCs, the mean  $DIV_{OBS}$  is 0.5347, with standard deviation of

**Table 2: Summary Statistics for Small BHCs and Total Period (1998 Q4 - 2008 Q4)**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Accounting returns					
ROA	0.0027	0.0028	0.0492	-0.0348	0.0021
Risk-adjusted ROA	6.4105	5.4069	54.5359	-3.2872	5.1576
ROE	0.0292	0.0303	0.4029	-1.1121	0.0323
Risk-adjusted ROE	6.3942	5.5470	46.7039	-3.4232	4.9290
Market returns					
Stock return	0.0110	0.0036	1.0188	-0.7397	0.1522
Risk-adjusted stock return	0.0849	0.0322	3.4473	-3.2170	1.0873
Credit risk					
Net charge-off ratio	0.0004	0.0002	0.0232	-0.0110	0.0012
Market risk					
Maturity gap ratio	0.1414	0.1153	0.7873	0.0000	0.1142
Derivatives loss ratio	0.0000	0.0000	0.0011	-0.0011	0.0000
Market beta	0.3892	0.2293	2.1484	-0.2126	0.4661
Interest rate beta	-0.0062	0.0076	0.8186	-0.6974	0.1561
Default risk					
Z - score	215.1264	177.5312	1472.5090	-0.2725	161.1679
Diversifications					
DIV <sub>DG</sub> (Domestic geographic)	0.0198	0.0000	0.6770	0.0000	0.0930
DIV <sub>L</sub> (Loan)	0.4202	0.4271	0.7587	0.0229	0.1470
DIV <sub>S</sub> (Security)	0.4139	0.5153	0.7974	0.0000	0.2626
DIV <sub>NII</sub> (Non-interest-income)	0.4656	0.4998	0.8193	0.0000	0.2090
DIV <sub>OBS</sub> (Off-balance-sheet)	0.1350	0.0778	0.7785	0.0000	0.1533
Control variables					
S2 (Domestic deposit ratio)	0.8126	0.8259	0.9987	0.2540	0.0781
S3 (Loan ratio)	0.6597	0.6712	0.9590	0.3055	0.1101
S4 (Security ratio)	0.1863	0.1806	0.6476	0.0000	0.1290
S5 (Non-interest-income ratio)	0.0023	0.0019	0.0538	0.0001	0.0018
S6 (Off-balance-sheet ratio)	0.1513	0.1353	1.1761	0.0016	0.0952
C1 (Log asset)	5.6946	5.7033	6.5645	4.9984	0.1646
C2 (Equity ratio)	0.0918	0.0902	0.2316	0.0171	0.0238
C3 (Asset growth)	0.0190	0.0152	0.8488	-0.4752	0.0451

Accounting results are for 184 BHCs

Market results are for 30 BHCs

**Table 3: Summary Statistics for Larger Community BHCs and Total Period  
(1998 Q4 – 2008 Q4)**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Accounting returns					
ROA	0.0029	0.0028	0.2613	-0.0507	0.0047
Risk-adjusted ROA	7.5221	6.1142	65.2686	-3.3662	6.3231
ROE	0.0308	0.0325	0.4273	-2.0215	0.0417
Risk-adjusted ROE	7.4609	6.0716	76.8496	-3.4351	6.1132
Market returns					
Stock return	0.0196	0.0133	1.2100	-0.8269	0.1552
Risk-adjusted stock return	0.1544	0.1227	3.2640	-3.5516	1.0704
Credit risk					
Net charge-off ratio	0.0007	0.0003	0.1121	-0.0051	0.0025
Market risk					
Maturity gap ratio	0.1577	0.1238	0.8525	0.0000	0.1326
Derivatives loss ratio	0.0000	0.0000	0.0097	-0.0085	0.0002
Market beta	0.7663	0.6595	2.2597	-0.1786	0.4751
Interest rate beta	-0.0082	0.0082	0.6720	-0.8749	0.1543
Default risk					
Z - score	234.6115	196.1783	1591.9660	-1.6871	174.4938
Diversifications					
DIV <sub>DG</sub> (Domestic geographic)	0.0703	0.0000	0.8284	0.0000	0.1597
DIV <sub>L</sub> (Loan)	0.4456	0.4573	0.7495	0.0000	0.1428
DIV <sub>S</sub> (Security)	0.4585	0.5251	0.8171	0.0000	0.2243
DIV <sub>NII</sub> (Non-interest-income)	0.4937	0.5336	0.8706	0.0000	0.2019
DIV <sub>OBS</sub> (Off-balance-sheet)	0.1838	0.1219	0.8313	0.0000	0.1839
Control variables					
S2 (Domestic deposit ratio)	0.7753	0.7951	0.9970	0.0272	0.1085
S3 (Loan ratio)	0.6707	0.6834	0.9593	0.1520	0.1156
S4 (Security ratio)	0.1902	0.1823	0.6517	0.0000	0.1191
S5 (Non-interest-income ratio)	0.0035	0.0023	0.3607	0.0000	0.0089
S6 (Off-balance-sheet ratio)	0.2230	0.1812	18.1125	0.0022	0.2839
C1 (Log asset)	6.2363	6.1635	7.3838	5.2880	0.3811
C2 (Equity ratio)	0.0912	0.0872	0.6114	0.0214	0.0344
C3 (Asset growth)	0.0290	0.0188	1.1681	-0.7814	0.0658

Accounting results are for 239 BHCs

Market results are for 70 BHCs



**Table 4: Summary Statistics for Regional BHCs and Total Period (1998 Q4 - 2008 Q4)**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Accounting returns					
ROA	0.0025	0.0030	0.0060	-0.0320	0.0031
Risk-adjusted ROA	6.8614	5.3271	35.8644	-3.2487	6.6266
ROE	0.0305	0.0377	0.0965	-0.6135	0.0444
Risk-adjusted ROE	7.2680	5.1846	48.1197	-3.3477	8.1229
Market returns					
Stock return	0.0039	0.0119	0.8033	-0.7366	0.1651
Risk-adjusted stock return	0.0180	0.0756	2.8414	-3.1274	1.1355
Credit risk					
Net charge-off ratio	0.0009	0.0006	0.0161	-0.0001	0.0015
Market risk					
Maturity gap ratio	0.2380	0.2428	0.6132	0.0013	0.1090
Derivatives loss ratio	0.0000	0.0000	0.0004	0.0000	0.0000
Market beta	0.9230	0.8879	2.2482	0.4248	0.2826
Interest rate beta	0.0002	0.0104	0.3890	-0.4529	0.1271
Default risk					
Z - score	189.2316	129.1392	990.7549	2.0469	170.6882
Diversifications					
DIV <sub>DG</sub> (Domestic geographic)	0.2519	0.0080	0.8009	0.0000	0.2897
DIV <sub>L</sub> (Loan)	0.4748	0.5320	0.7546	0.0004	0.2074
DIV <sub>S</sub> (Security)	0.3482	0.2927	0.7865	0.0403	0.2132
DIV <sub>NII</sub> (Non-interest-income)	0.5727	0.6160	0.8568	0.0000	0.1831
DIV <sub>OBS</sub> (Off-balance-sheet)	0.5347	0.6159	0.8090	0.0000	0.2221
Control variables					
S2 (Domestic deposit ratio)	0.5946	0.6158	0.9969	0.2159	0.1276
S3 (Loan ratio)	0.6763	0.6971	0.8796	0.3454	0.1109
S4 (Security ratio)	0.1572	0.1345	0.4574	0.0455	0.0816
S5 (Non-interest-income ratio)	0.0045	0.0035	0.0282	0.0001	0.0037
S6 (Off-balance-sheet ratio)	1.0321	0.7093	6.0774	0.0185	1.0745
C1 (Log asset)	7.5464	7.5579	8.0783	6.2423	0.3169
C2 (Equity ratio)	0.0843	0.0805	0.1379	0.0521	0.0171
C3 (Asset growth)	0.0304	0.0175	1.1821	-0.1477	0.1019

Accounting results are for 10 BHCs

Market results are for 10 BHCs

**Table 5: Summary Statistics for Money Center BHCs and Total Period (1998 Q4 – 2008 Q4)**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Accounting returns					
ROA	0.0032	0.0035	0.0151	-0.0089	0.0017
Risk-adjusted ROA	7.4152	4.8824	55.7339	-2.3097	7.5401
ROE	0.0383	0.0423	0.1379	-0.1219	0.0211
Risk-adjusted ROE	7.4225	4.7307	64.5508	-2.1600	10.1283
Market returns					
Stock return	0.0166	0.0144	0.6956	-0.6689	0.1556
Risk-adjusted stock return	0.1293	0.1420	3.1074	-2.9280	1.0849
Credit risk					
Net charge-off ratio	0.0010	0.0009	0.0109	-0.0004	0.0009
Market risk					
Maturity gap ratio	0.2101	0.2117	0.6335	0.0025	0.0974
Derivatives loss ratio	0.0000	0.0000	0.0004	0.0000	0.0000
Market beta	1.1186	1.0912	1.9042	0.6844	0.2512
Interest rate beta	0.0012	0.0112	0.3810	-0.5019	0.1166
VaR ratio	0.0001	0.0001	0.0002	0.0000	0.0000
Default risk					
Z - score	186.0960	118.2877	1054.0930	16.6398	178.5651
Diversifications					
DIV <sub>DG</sub> (Domestic geographic)	0.1937	0.0824	0.7953	0.0000	0.2364
DIV <sub>L</sub> (Loan)	0.5755	0.6075	0.7535	0.0493	0.1281
DIV <sub>S</sub> (Security)	0.4710	0.4827	0.7911	0.0637	0.1662
DIV <sub>NII</sub> (Non-interest-income)	0.6550	0.7120	0.8628	0.2202	0.1616
DIV <sub>OBS</sub> (Off-balance-sheet)	0.6529	0.6612	0.8592	0.2010	0.1273
Control variables					
S2 (Domestic deposit ratio)	0.4605	0.5491	0.6982	0.0899	0.1989
S3 (Loan ratio)	0.5277	0.6022	0.7911	0.0481	0.2071
S4 (Security ratio)	0.1564	0.1432	0.6175	0.0300	0.0930
S5 (Non-interest-income ratio)	0.0059	0.0055	0.0144	0.0010	0.0026
S6 (Off-balance-sheet ratio)	9.4391	2.3207	63.7491	0.2829	13.1230
C1 (Log asset)	8.4157	8.2852	9.3726	7.5369	0.4889
C2 (Equity ratio)	0.0823	0.0833	0.1202	0.0435	0.0158
C3 (Asset growth)	0.0469	0.0222	1.1043	-0.3839	0.1453

Accounting results are for 9 BHCs

Market results are for 9 BHCs

**Table 6: Summary Statistics for International BHCs and Total Period (1998 Q4 – 2008 Q4)**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Accounting returns					
ROA	0.0028	0.0031	0.0056	-0.0089	0.0016
Risk-adjusted ROA	5.0667	4.2460	23.2171	-2.3097	4.0567
ROE	0.0376	0.0408	0.0997	-0.1219	0.0229
Risk-adjusted ROE	5.1609	4.0527	48.1197	-2.1600	6.3583
Market returns					
Stock return	0.0177	0.0172	0.6599	-0.6689	0.1636
Risk-adjusted stock return	0.1170	0.1435	2.6943	-2.9280	1.0685
Credit risk					
Net charge-off ratio	0.0009	0.0008	0.0071	-0.0001	0.0008
Market risk					
Maturity gap ratio	0.1934	0.1881	0.6335	0.0025	0.1020
Derivatives loss ratio	0.0000	0.0000	0.0004	0.0000	0.0000
Market beta	1.1504	1.1569	1.9042	0.5938	0.2926
Interest rate beta	-0.0055	-0.0085	0.3810	-0.3449	0.1243
Default risk					
Z - score	126.9590	103.2607	502.2505	16.6398	79.0468
Diversifications					
H1 (International geographic)	0.6410	0.7628	0.9136	0.0000	0.2861
DIV <sub>DG</sub> (Domestic geographic)	0.1647	0.0758	0.5708	0.0000	0.1995
DIV <sub>L</sub> (Loan)	0.5466	0.5721	0.7535	0.0493	0.1408
DIV <sub>S</sub> (Security)	0.4179	0.4362	0.7911	0.0403	0.2264
DIV <sub>NII</sub> (Non-interest-income)	0.6397	0.7025	0.8628	0.2202	0.1678
DIV <sub>OBS</sub> (Off-balance-sheet)	0.5739	0.6076	0.8051	0.1582	0.1510
Control variables					
S1 (Cross-border loan exposure ratio)	2.4263	0.0528	45.2932	0.0000	8.7476
S2 (Domestic deposit ratio)	0.3981	0.3747	0.7985	0.0899	0.2247
S3 (Loan ratio)	0.4632	0.4599	0.8596	0.0481	0.2288
S4 (Security ratio)	0.1644	0.1277	0.6175	0.0300	0.1180
S5 (Non-interest-income ratio)	0.0056	0.0050	0.0144	0.0010	0.0029
S6 (Off-balance-sheet ratio)	13.2779	9.3343	63.7491	0.2515	14.6332
C1 (Log asset)	8.2879	8.5050	9.3726	6.9721	0.7851
C2 (Equity ratio)	0.0757	0.0752	0.1235	0.0435	0.0152
C3 (Asset growth)	0.0344	0.0183	0.9569	-0.3839	0.1263

VaR is for 4 BHCs

The others are for 6 BHCs

**Table 7: Summary Statistics for All BHCs and Total Period (1998 Q4 – 2008 Q4)**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Accounting returns					
ROA	0.0028	0.0028	0.2613	-0.0507	0.0037
Risk-adjusted ROA	7.0422	5.7513	65.2686	-3.3662	5.9271
ROE	0.0303	0.0318	0.4273	-2.0215	0.0378
Risk-adjusted ROE	7.0117	5.7926	76.8496	-3.4351	5.8451
Market returns					
Stock return	0.0159	0.0108	1.2100	-0.8269	0.1554
Risk-adjusted stock return	0.1235	0.1020	3.4473	-3.5516	1.0819
Credit risk					
Net charge-off ratio	0.0006	0.0002	0.1121	-0.0110	0.0020
Market risk					
Maturity gap ratio	0.1538	0.1248	0.8525	0.0000	0.1253
Derivatives loss ratio	0.0000	0.0000	0.0097	-0.0085	0.0002
Market beta	0.7111	0.6365	2.2597	-0.2126	0.4932
Interest rate beta	-0.0063	0.0087	0.8186	-0.8749	0.1501
Default risk					
Z - score	224.4855	184.1123	1591.9660	-1.6871	169.5014
Diversifications					
DIV <sub>DG</sub> (Domestic geographic)	0.0559	0.0000	0.8284	0.0000	0.1494
DIV <sub>L</sub> (Loan)	0.4383	0.4485	0.7587	0.0000	0.1480
DIV <sub>S</sub> (Security)	0.4377	0.5187	0.8171	0.0000	0.2412
DIV <sub>NII</sub> (Non-interest-income)	0.4871	0.5223	0.8706	0.0000	0.2061
DIV <sub>OBS</sub> (Off-balance-sheet)	0.1810	0.1070	0.8592	0.0000	0.1943
Control variables					
S2 (Domestic deposit ratio)	0.7803	0.8043	0.9987	0.0272	0.1157
S3 (Loan ratio)	0.6634	0.6780	0.9593	0.0481	0.1176
S4 (Security ratio)	0.1871	0.1790	0.6517	0.0000	0.1224
S5 (Non-interest-income ratio)	0.0031	0.0022	0.3607	0.0000	0.0068
S6 (Off-balance-sheet ratio)	0.3991	0.1638	63.7491	0.0016	2.2992
C1 (Log asset)	6.0848	5.9215	9.3726	4.9984	0.5759
C2 (Equity ratio)	0.0911	0.0882	0.6114	0.0171	0.0298
C3 (Asset growth)	0.0252	0.0173	1.1821	-0.7814	0.0623

Accounting results are for 442 BHCs

Market results are for 119 BHCs

0.2221. For money center BHCs, the mean  $DIV_{OBS}$  is 0.6529, with standard deviation of 0.1273. For international BHCs, the mean  $DIV_{OBS}$  is 0.5739, with standard deviation of 0.1510. For all BHCs, the mean  $DIV_{OBS}$  is 0.1810, with standard deviation of 0.1943. The results show that the larger the BHCs, the higher level of off-balance-sheet diversification they have.

Table 8 summarizes the mean values in order of magnitude. Smaller BHCs seem to perform worse on returns but have lower risk on returns, while larger BHCs have larger returns but higher risk on returns. Larger community BHCs perform the best on both risk-adjusted accounting returns and market returns while money center BHCs perform the second best. Therefore, the results show that it is beneficial for small BHCs expand to larger community BHCs and for regional BHCs expand to money center BHCs. However, larger BHCs have higher credit risk, market risk and default risk.

Table 9 and 10 present correlation coefficients among variables which are incorporated in the panel regression. The larger correlation coefficients for dependent variables are -0.63 between loan ratio and security ratio, 0.59 between international geographic diversification and security diversification, 0.56 between international geographic diversification and log asset, and -0.54 between domestic geographic diversification and log asset. Table 11 reports multicollinearity tests for dependent variables. The variance inflation factors (VIF) show that there is no perfect multicollinearity among dependent variables in the regression.

**Table 8: Order of Mean Values for BHC Groups**

		Small BHCs	Larger community BHCs	Regional BHCs	Money center BHCs
Accounting returns					
Risk on asset	ROA	2	3	1	4
risk-adjusted return on asset	RAROA	1	4	2	3
return on equity	ROE	1	3	2	4
risk-adjusted return on equity	RAROE	1	4	2	3
Market returns					
Stock return	SR	2	4	1	3
Risk-adjusted stock return	RASR	2	4	1	3
Credit risk					
Net charge-offs	NCO	4	3	2	1
Market risk					
Maturity gap	MG	4	3	1	2
Derivatives loss	DL	1	1	1	1
Market beta	MB	4	3	2	1
Interest rate beta	IRB	3	4	2	1
Default risk					
Distance to default	Z-score	3	4	2	1
Diversifications					
Domestic geographic Div.	DIV <sub>DG</sub>	1	2	4	3
Loan Div.	DIV <sub>L</sub>	1	2	3	4
Security Div.	DIV <sub>S</sub>	2	3	1	4
Non-interest-income Div.	DIV <sub>NII</sub>	1	2	3	4
Off-balance-sheet Div.	DIV <sub>OBS</sub>	1	2	3	4

For performances

1 indicates the worst - - 4 indicates the best

For diversifications

1 indicates the smallest - - 4 indicates the largest

**Table 9: Correlation Coefficients for Dependent Variables**

	Variable Abbreviation	ROA	RAROA	ROE	RAROE	SR	RASR	NCO	MG	DL	MB	IRB	Z	VaR
International Geographic Div.	H1	-0.23	-0.26	-0.08	-0.36	0.09	0.11	0.05	-0.36	0.10	0.33	-0.13	-0.24	0.45
Domestic Geographic Div.	H2	-0.02	-0.03	-0.03	-0.03	0.00	0.00	0.01	0.03	0.00	0.06	-0.02	-0.03	0.29
Loan Div.	H3	0.03	0.00	0.04	0.02	0.03	0.04	0.03	0.00	0.00	0.05	-0.04	-0.02	0.22
Security Div.	H4	-0.01	0.02	-0.04	-0.01	0.05	0.05	0.02	-0.03	0.00	0.09	0.02	0.05	0.21
Non-interest-income Div.	H5	-0.08	0.05	-0.06	0.02	0.00	0.00	-0.02	0.03	0.00	0.16	0.00	0.08	0.06
Off-balance-sheet Div.	H6	-0.06	-0.05	-0.04	-0.06	-0.04	-0.04	0.04	0.15	0.03	0.21	0.01	-0.08	-0.05
Cross-border Loan Exposure Ratio	S1	0.25	0.21	0.24	0.03	0.04	0.08	-0.19	-0.02	-0.05	-0.40	0.13	0.08	0.37
Domestic Deposit Ratio	S2	-0.03	0.02	0.02	0.03	0.03	0.03	-0.06	-0.10	-0.02	-0.32	0.05	0.03	-0.20
Loan Ratio	S3	-0.03	-0.01	-0.03	-0.02	-0.05	-0.06	0.08	0.03	0.01	-0.02	-0.05	-0.03	-0.20
Security Ratio	S4	0.02	0.05	0.00	0.03	0.08	0.10	-0.05	-0.06	-0.01	-0.03	-0.06	0.07	-0.21
Non-interest-income Ratio	S5	0.60	-0.07	0.14	-0.07	0.00	0.01	0.53	0.09	0.01	0.24	-0.07	-0.10	-0.05
Off-balance-sheet Ratio	S6	-0.01	-0.04	0.00	-0.05	0.00	-0.01	0.02	0.03	0.01	0.21	0.00	-0.06	0.51
Log Asset	C1	-0.03	0.07	-0.01	0.05	-0.03	-0.03	0.07	0.13	0.02	0.49	-0.04	0.02	0.27
Equity Ratio	C2	0.43	0.04	0.05	0.01	-0.01	-0.01	0.25	0.01	0.00	0.07	0.00	0.14	-0.20
Asset Growth	C3	-0.02	0.00	0.06	0.01	0.03	0.02	-0.03	0.02	0.00	-0.03	0.01	-0.01	0.00
ROA: return on asset	RAROA: risk-adjusted return on asset			ROE: return on equity			RAROE: risk-adjusted return on equity							
SR: stock return	RASR: risk-adjusted stock return			NCO: net charge-offs			MG: maturity gap			DL: derivatives loss			MB:	
market beta	IRB: interest rate beta		VaR: value at risk		Z: distance to default									

**Table 10: Correlation Coefficients for Independent Variables**

	Variable Abbreviation	H1	H2	H3	H4	H5	H6	S1	S2	S3	S4	S5	S6	C1	C2	C3
International Geographic Div.	H1	1.00														
Domestic Geographic Div.	H2	0.09	1.00													
Loan Div.	H3	0.15	0.10	1.00												
Security Div.	H4	0.59	0.08	-0.08	1.00											
Non-interest-income Div.	H5	-0.09	0.05	0.02	0.53	1.00										
Off-balance-sheet Div.	H6	0.11	0.20	0.04	0.20	0.30	1.00									
Cross-border Loan Exposure Ratio	S1	-0.08	-0.22	-0.10	-0.20	0.08	-0.61	1.00								
Domestic Deposit Ratio	S2	-0.72	-0.15	-0.02	-0.08	-0.10	-0.40	0.34	1.00							
Loan Ratio	S3	-0.63	-0.02	-0.08	0.03	0.09	-0.02	0.16	0.26	1.00						
Security Ratio	S4	0.01	-0.01	-0.07	0.46	0.32	0.11	0.29	-0.16	-0.63	1.00					
Non-interest-income Ratio	S5	0.22	0.05	0.02	0.09	-0.05	0.09	-0.03	-0.15	-0.11	0.07	1.00				
Off-balance-sheet Ratio	S6	0.52	0.08	0.12	0.02	0.10	0.23	-0.21	-0.36	-0.18	-0.05	0.04	1.00			
Log Asset	C1	0.56	0.35	0.13	0.16	0.32	0.55	-0.43	-0.54	-0.09	0.10	0.09	0.44	1.00		
Equity Ratio	C2	-0.38	0.03	-0.01	0.06	0.00	-0.07	-0.02	-0.04	-0.11	0.08	0.41	-0.06	-0.06	1.00	
Asset Growth	C3	0.09	0.05	-0.01	-0.04	-0.06	0.00	-0.06	-0.07	-0.01	-0.05	-0.05	0.03	0.06	-0.07	1.00



**Table 11: Multicollinearity Tests**

	Variable Abbreviation	R-Squared	VIF
International Geographic Div.	H1	0.75	3.98
Domestic Geographic Div.	H2	0.15	1.18
Loan Div.	H3	0.06	1.07
Security Div.	H4	0.48	1.91
Non-interest-income Div.	H5	0.43	1.76
Off-balance-sheet Div.	H6	0.35	1.55
Cross-border Loan Exposure Ratio	S1	0.53	2.14
Domestic Deposit Ratio	S2	0.38	1.62
Loan Ratio	S3	0.64	2.80
Security Ratio	S4	0.70	3.33
Non-interest-income Ratio	S5	0.21	1.27
Off-balance-sheet Ratio	S6	0.31	1.46
Log Asset	C1	0.55	2.24
Equity Ratio	C2	0.20	1.26
Asset Growth	C3	0.02	1.02

VIF: Variance inflation factor

## **CHAPTER VI**

### **EMPIRICAL RESULTS**

The effects of diversifications are estimated for several BHC groups and sub-periods (the whole observing period, before the crisis and during the crisis). Performances are examined in terms of accounting returns, market returns, credit risk, market risk and default risk.

#### **6.1 Individual Diversification and Interaction Effect Analysis**

##### **1. SMALL BHCs**

###### **1.1 Accounting returns**

(a) **Return on asset (ROA)** – Appendix 1 reports the statistical results

Total period:

Two types of diversification have significant impacts on ROA. The impact of security diversification is negative while the impact of non-interest-income diversification is positive. The coefficient on security diversification (H4) is -0.0010. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROA with the coefficient of 0.0053. Therefore, greater security

diversification could still improve ROA with positive net impact of  $-0.0010 + 0.0053 * S4$  if  $S4$  is greater than 0.1887. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on non-interest-income diversification (H5) is 0.0025. However the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and negatively related to ROA with the coefficient of -1.1756. Therefore, greater non-interest-income diversification could still reduce ROA with negative net impact of  $0.0025 - 1.1756 * S5$  if  $S5$  is greater than 0.0022. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio. If the ratio is large enough, the impact turns from positive to negative.

#### Sub-period analysis:

Loan diversification (H3) has no impact on ROA before the financial crisis 2007 – 2008 but it has significant positive impact (0.0113) during the crisis. Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to ROA with the coefficient of -0.0132 during the crisis. Therefore, greater loan diversification could still reduce ROA with negative net impact of  $0.0113 - 0.0132 * S3$  if  $S3$  is greater than 0.8561. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on security diversification (H4) is significantly negative (-0.0007) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to ROA with the coefficient of 0.0024 before the crisis. Therefore, greater security diversification could still improve ROA with positive net impact

of  $-0.0007 + 0.0024 * S4$  if  $S4$  is greater than 0.2917. The results show that the sign of the impact of security diversification depends on the scale of security ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on non-interest-income diversification (H5) is significantly positive (0.0028) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to ROA with the coefficient of -1.3594 before the crisis. Therefore, greater non-interest-income diversification could still reduce ROA with negative net impact of  $0.0028 - 1.3594 * S5$  if  $S5$  is greater than 0.0021. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

For interaction effects of diversifications, none of them are significant before the crisis. However, during the crisis the coefficient on all-activity diversifications (H2\*H3\*H4\*H5\*H6) is significantly positive (0.2547).

**(b) Risk-adjusted return on asset (RAROA)** - Appendix 2 reports the statistical results  
Total period:

Only security diversification (H4) has significant impact on RAROA. The impact is negative with the coefficient of -1.5584.

Sub-period analysis:

Before the crisis, none of diversifications and interactions is significant. During the crisis, the coefficient on non-interest-income diversification (H5) is significantly positive (3.3148). However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to RAROA with the coefficient of -648.5177 during the crisis. Therefore, greater non-interest-income

diversification could still reduce ROA with negative net impact of  $3.3148 - 648.5177 * S5$  if  $S5$  is greater than 0.0052. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio during the crisis. If the ratio is large enough, the impact turns from positive to negative.

(c) **Return on equity (ROE)** - Appendix 3 reports the statistical results

Total period:

Two types of diversification have significant impacts on ROE. The impact of security diversification is negative while the impact of non-interest-income diversification is positive. The coefficient on security diversification (H4) is -0.0157. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROE with the coefficient of 0.0787. Therefore, greater security diversification could still improve ROE with positive net impact of  $-0.0157 + 0.0787 * S4$  if  $S4$  is greater than 0.1995. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on non-interest-income diversification (H5) is 0.0232. However the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to ROE with the coefficient of -10.7006. Therefore, greater non-interest-income diversification could still reduce ROE with negative net impact of  $0.0232 - 10.7006 * S5$  if  $S5$  is greater than 0.0022. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio. If the ratio is large enough, the impact turns from positive to negative.

Sub-period analysis:

Loan diversification (H3) has no impact on ROE before the crisis but it has significant

positive impact (0.1641) during the crisis. However the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to ROE with the coefficient of -0.1882 during the crisis. Therefore, greater loan diversification could still reduce ROE with negative net impact of  $0.1641 - 0.1882 * S3$  if  $S3$  is greater than 0.8720. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from positive to negative.

Although the impacts of non-interest-income diversification ( $H5$ ) before and during the crisis are both positively significant with the coefficients of 0.0260 and 0.0288, respectively, the coefficient on the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly negative (-12.2575) before the crisis but it becomes insignificant during the crisis. Therefore, greater non-interest-income diversification could still reduce ROE with negative net impact of  $0.0260 - 12.2575 * S5$  if  $S5$  is greater than 0.0022. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

**(d) Risk-adjusted return on equity (RAROE)** - Appendix 4 reports the statistical results

Total period:

Only security diversification ( $H4$ ) has significant impact on RAROE. The impact is negative with the coefficient of -1.4671.

Sub-period analysis:

The coefficient on domestic geographic diversification ( $H2$ ) is significantly negative (-14.2084) before the crisis while it becomes insignificant during the crisis. The coefficient on non-interest-income diversification ( $H5$ ) is insignificant before the crisis but it becomes positively significant (3.2811) during the crisis. In addition, during the

crisis the coefficient on the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and largely negative (-689.7074). Therefore, greater non-interest-income diversification during the crisis could still reduce RAROE with negative net impact of  $3.2811 - 689.7074 * S5$  if  $S5$  is greater than 0.0048. The results show that during the crisis the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio. If the ratio is large enough, the impact turns from positive to negative.

**Summary for accounting returns** - Table 12 reports the summary of significant effects of diversifications and interactions for total period. Table 13 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## 1.2 Market returns

(a) **Stock return (SR)** –Appendix 5 reports the statistical results.

### Total period:

Only non-interest-income diversification ( $H5$ ) has significant impact on SR. The impact is negative with the coefficient of -0.0642. However the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and positively related to SR with the coefficient of 40.2470. Therefore, greater non-interest-income diversification could still improve SR with positive net impact of  $-0.0642 + 40.2470 * S5$  if  $S5$  is greater than 0.0016. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio. If the ratio is large enough, the impact turns from negative to positive.

Although individual off-balance-sheet diversification ( $H6$ ) has no significant impact on SR, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to SR with the coefficient of -0.4783.

**Table 12: Summary of Significant Effects of Diversifications for Small BHCs**  
**for Total Period**

		<u>Accounting Returns</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3				
Security Div. (SD)	H4	-	-	-	-
Non-interest-income Div. (NIID)	H5	+		+	
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3				
Security Div. (SD)	H4*S4	+		+	
Non-interest-income Div. (NIID)	H5*S5	-		-	
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5				
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity  
RAROE: risk-adjusted return on equity



**Table 13: Summary of Significant Effects of Diversifications for Small BHCs**

**for Sub-periods**

		Accounting Returns							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2				-				
Loan Div. (LD)	H3					+		+	
Security Div. (SD)	H4	-							
Non-interest-income Div. (NIID)	H5	+		+			+	+	+
Off-balance-sheet Div. (OBSD)	H6								
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2								
Loan Div. (LD)	H3*S3	-		-		-		-	
Security Div. (SD)	H4*S4	+							
Non-interest-income Div. (NIID)	H5*S5	-		-		-	-		-
Off-balance-sheet Div. (OBSD)	H6*S6								
<b>Activity interaction</b>									
DGD * LD	H2*H3								
DGD * NIID	H2*H5								
SD * OBSD	H4*H6								
All Activities	H2*H3*H4*H5*H6					+		+	

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity

RAROE: risk-adjusted return on equity

Therefore, off-balance-sheet diversification still reduces SR.

Sub-period analysis:

There are no differences on the effects of diversifications between the before- and during-the-crisis periods.

(b) **Risk-adjusted stock return (RASR)** –Appendix 6 reports the statistical results.

Total period:

Two types of diversification have significant impacts on RASR. The impact of security diversification is positive while the impact of non-interest-income diversification is negative. The coefficient on security diversification (H4) is 0.5725. The coefficient on non-interest-income diversification (H5) is -0.5936. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to RASR with the coefficient of 182.2321. Therefore, greater non-interest-income diversification could still improve ROA with positive net impact of  $-0.5936 + 182.2321 * S5$  if S5 is greater than 0.0033. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

Although domestic geographic diversification (H2) and loan diversification (H3) individually have no significant impact on RASR, the interaction of them (H2\*H3) has significant negative impact on RASR with the coefficient of -8.8037.

Sub-period analysis:

The coefficient on security diversification (H4) is significantly positive (0.7162) and the coefficient on non-interest-income diversification (H5) is significantly negative (-0.3902) before the crisis. During the crisis, both of them become insignificant.

The coefficient on the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is insignificant before the crisis while it becomes negatively significant

during the crisis. In addition, the negative impact (-1.5439) of the interaction of security diversification and security ratio ( $H4*S4$ ) before the crisis becomes insignificant during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is significantly negative (-9.4214) before the crisis while it becomes insignificant during the crisis. However, the coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is insignificant before the crisis but it becomes negatively significant (-163.8264) during the crisis.

**Summary for market returns** - Table 14 reports the summary of significant effects of diversifications and interactions for total period. Table 15 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 1.3 Credit risk

**Net charge-offs (NCO)** –Appendix 7 reports the statistical results.

#### Total period:

Two types of diversification have significant impacts on NCO. The impact of non-interest-income diversification is negative while the impact of off-balance-sheet diversification is positive. The coefficient on non-interest-income diversification ( $H4$ ) is -0.0005. The coefficient on off-balance-sheet diversification is 0.0015. However the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to NCO with the coefficient of -0.0023. Therefore, greater off-balance-sheet diversification could still reduce NCO with negative net impact of  $0.0015 - 0.0023 * S6$  if  $S6$  is greater than 0.6522. The results show that the sign of the impact of off-balance-sheet diversification depends on the scale of off-balance-sheet ratio. If the ratio is large enough, the impact turns from positive to negative.

**Table 14: Summary of Significant Effects of Diversifications for Small BHCs  
for Total Period**

		<u>Market Returns</u>	
	Variable Abbreviation	SR	RASR
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		
Security Div. (SD)	H4		+
Non-interest-income Div. (NIID)	H5	-	-
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5	+	+
Off-balance-sheet Div. (OBSD)	H6*S6	-	
<b>Activity interaction</b>			
DGD * LD	H2*H3		-
DGD * NIID	H2*H5		
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

SR: stock return      RASR: risk-adjusted stock return

**Table 15: Summary of Significant Effects of Diversifications for Small BHCs  
for Sub-periods**

Variable Abbreviation		Market Returns			
		<u>Before The Crisis</u>		<u>During The Crisis</u>	
		SR	RASR	SR	RASR
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3				
Security Div. (SD)	H4		+		
Non-interest-income Div. (NIID)	H5		-		
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				-
Loan Div. (LD)	H3*S3				
Security Div. (SD)	H4*S4		-		
Non-interest-income Div. (NIID)	H5*S5				
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
DGD * LD	H2*H3		-		
DGD * NIID	H2*H5				
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				-

SR: stock return      RASR: risk-adjusted stock return

The interaction of security and off-balance-sheet diversifications (H4\*H6) has significant negative impact on NCO with the coefficient of -0.0014.

Sub-period analysis:

The coefficient on security diversification (H4) is insignificant before the crisis while it becomes positively significant (0.0018). The interaction of security diversification and security ratio (H4\*S4) is significantly and negatively related to NCO with the coefficient of -0.0058. Therefore, greater security diversification could still reduce NCO with negative net impact of  $0.0018 - 0.0058 * S4$  if  $S4$  is greater than 0.3104. The results show that the sign of the impact of security diversification depends on the scale of security ratio during the crisis. If the ratio is large enough, the impact turns from positive to negative.

Both the coefficients on non-interest-income diversification (H5) before and during the crisis are significantly negative (-0.0005 and -0.0019, respectively). However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to NCO with the coefficient of 0.2326 during the crisis. Therefore, greater non-interest-income diversification could still increase NCO with positive net impact of  $-0.0019 + 0.2326 * S5$  if  $S5$  is greater than 0.0082. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on off-balance-sheet diversification (H6) is 0.0012 during the crisis but it becomes insignificant during the crisis. Before the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to NCO with the coefficient of -0.0021. Therefore, greater off-balance-sheet diversification could still reduce ROA with negative net impact of  $0.0012 - 0.0021 * S6$  if  $S6$  is greater than 0.5715. The results show that the sign of the

impact of off-balance-sheet diversification depends on the scale of off-balance-sheet ratio. If the ratio is large enough, the impact turns from positive to negative.

The interaction of all-activity diversification is insignificant before the crisis while it becomes significantly negative with the coefficient of -0.1171 during the crisis.

**Summary for credit risk** - Table 16 reports the summary of significant effects of diversifications and interactions for total period. Table 17 reports the summary of significant effects of diversifications and interactions for the sub-periods.

#### 1.4 Market risk

(a) **Maturity gap (MG)** –Appendix 8 reports the statistical results.

##### Total period:

Only loan diversification (H3) has significant impact on MG. The impact is positive with the coefficient of 0.2695. However the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to MG with the coefficient of -0.3913. Therefore, greater loan diversification could still reduce MG with negative net impact of  $0.2695 - 0.3913 * S3$  if S3 is greater than 0.6888. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio. If the ratio is large enough, the impact turns from positive to negative.

Although individual security diversification (H4) has no significant impact on MG, the interaction of security diversification and security ratio (H4\*S4) is significantly and negatively related to MG with the coefficient of -0.2125. Therefore, security diversification still reduces MG.

##### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes positively significant with the coefficient of 1.1787 during the

**Table 16: Summary of Significant Effects of Diversifications for Small BHCs  
for Total Period**

		<u>Credit Risk</u>
	Variable Abbreviation	NCO
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	-
Off-balance-sheet Div. (OBSD)	H6	+
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	-
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	-
All Activities	H2*H3*H4*H5*H6	

NCO: net charge-offs



**Table 17: Summary of Significant Effects of Diversifications for Small BHCs**  
for Sub-periods

		Credit Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	NCO	NCO
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		
Security Div. (SD)	H4		+
Non-interest-income Div. (NIID)	H5	-	-
Off-balance-sheet Div. (OBSD)	H6	+	
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3	+	
Security Div. (SD)	H4*S4		-
Non-interest-income Div. (NIID)	H5*S5		+
Off-balance-sheet Div. (OBSD)	H6*S6	-	
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5		
SD * OBSD	H4*H6	-	-
All Activities	H2*H3*H4*H5*H6		-

NCO: net charge-offs

crisis. Moreover, during the crisis the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and negatively related to MG with the coefficient of -1.8348. Therefore, greater domestic geographic diversification could still reduce MG with negative net impact of  $1.1787 - 1.8348 * S2$  if  $S2$  is greater than 0.6425. The results show that the sign of the impact of domestic geographic diversification depends on the scale of domestic geographic ratio. If the ratio is large enough, the impact turns from positive to negative.

Similarly, the coefficient on security diversification ( $H4$ ) is insignificant before the crisis while it becomes positively significant with the coefficient of 0.1767 during the crisis. Moreover, during the crisis the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and negatively related to MG with the coefficient of -0.6044. Therefore, greater security diversification could still reduce MG with negative net impact of  $0.1767 - 0.6044 * S4$  if  $S4$  is greater than 0.2924. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from positive to negative.

Both the coefficients of off-balance-sheet diversification ( $H6$ ) before and during the crisis are insignificant. However, before the crisis the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to MG with the coefficient of -0.1794. Therefore, off-balance-sheet diversification still reduces MG before the crisis.

The interaction impact of domestic geographic and loan diversifications ( $H2*H3$ ) is insignificant before the crisis while it becomes positively significant with the coefficient of 0.9353.

(b) **Derivatives loss (DL)** –Appendix 9 reports the statistical results.

Total period:

Only off-balance-sheet diversification ( $H6$ ) has significant impact on DL. The impact

is negative with the coefficient of -0.00002. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to DL with the coefficient of 0.0001. Therefore, greater off-balance-sheet diversification could still increase DL with positive net impact of  $-0.00002 + 0.0001 * S6$  if  $S6$  is greater than 0.2. The results show that the sign of the impact of off-balance-sheet diversification depends on the scale of off-balance-sheet ratio. If the ratio is large enough, the impact turns from negative to positive.

The interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) has significant positive impact on DL with the coefficient of 0.00003.

#### Sub-period analysis:

The coefficient of non-interest-income diversification ( $H5$ ) is significantly negative (-0.0000001) before the crisis while it becomes insignificant during the crisis. Although the coefficient of off-balance-sheet diversification ( $H6$ ) is insignificant before the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to DL with the coefficient of 0.0000008. Therefore, off-balance-sheet diversification still increases DL before the crisis. On the contrary, the coefficient on off-balance-sheet diversification is significantly negative (-0.0001) during the crisis. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to DL with the coefficient of 0.0003. Therefore, greater off-balance-sheet diversification could still increase DL with positive net impact of  $-0.0001 + 0.0003 * S6$  if  $S6$  is greater than 0.3334. The results show that the sign of the impact of off-balance-sheet diversification depends on the scale of off-balance-sheet ratio. If the ratio is large enough, the impact turns from negative to positive.

Although the interaction impact of security and off-balance-sheet diversifications ( $H4*H6$ ) on DL is insignificant before the crisis but it becomes positively significant

with the coefficient of 0.0001.

(c) **Market beta (MB)** –Appendix 10 reports the statistical results.

Total period:

Only off-balance-sheet diversification (H6) has significant impact on MB. The impact is positive with the coefficient of 0.6332. However the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to MB with the coefficient of -1.6673. Therefore, greater off-balance-sheet diversification could still reduce MB with negative net impact of  $0.6332 - 1.6673 * S6$  if S6 is greater than 0.3798. The results show that the sign of the impact of off-balance-sheet diversification depends on the scale of off-balance-sheet ratio. If the ratio is large enough, the impact turns from positive to negative.

The interaction of security and off-balance-sheet diversifications (H4\*H6) has significant negative impact on MB with the coefficient of -0.6017.

Sub-period analysis:

The coefficient on security diversification (H4) is insignificant before the crisis while it becomes positively significant with the coefficient of 0.7266 during the crisis. Although both the coefficients of non-interest-income diversification (H5) before and during the crisis are insignificant, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to MB with the coefficient of 130.0089. Therefore, non-interest-income diversification still increases MB during the crisis.

Before the crisis, the coefficient on off-balance-sheet diversification (H6) is significant 0.5493. However the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to MB with the coefficient of -1.1921. Therefore, greater off-balance-sheet diversification could still

reduce MB with negative net impact of  $0.5493 - 1.1921 * S6$  if  $S6$  is greater than 0.4608. The results show that the sign of the impact of off-balance-sheet diversification depends on the scale of off-balance-sheet ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative. However, the coefficient on off-balance-sheet diversification is insignificant during the crisis.

The interaction impact of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes negatively significant with the coefficient of -12.0160 during the crisis. Similarly, the interaction impact of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is insignificant before the crisis but it becomes positively significant with the coefficient of 47.3209 during the crisis.

(d) **Interest rate beta (IRB)** –Appendix 11 reports the statistical results.

Total period:

Only the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) has significant negative impact on IRB with the coefficient of -0.8298.

Sub-period analysis:

Domestic geographic diversification ( $H2$ ) has no impact on IRB before the crisis but it has significant negative impact (-17.0736) during the crisis. However, the coefficient on the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly positive (21.2335). Therefore, greater domestic geographic diversification could still increase IRB with positive net impact of  $-17.0736 + 21.2335 * S2$  if  $S2$  is greater than 0.8041. The results show that the sign of the impact of domestic geographic diversification depends on the scale of domestic geographic ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although individual off-balance-sheet diversification ( $H6$ ) has no significant impact

on IRB before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to IRB with the coefficient of 2.2531 during the crisis. Therefore, off-balance-sheet diversification still increases IRB during the crisis.

**Summary for market risk** - Table 18 reports the summary of significant effects of diversifications and interactions for total period. Table 19 reports the summary of significant effects of diversifications and interactions for the sub-periods.

#### 1.5 Default risk

**Distance to default (Z-score)** –Appendix 12 reports the statistical results.

##### Total period:

Although individual security diversification ( $H4$ ) has no significant impact on Z, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to Z with the coefficient of 231.80. Therefore, security diversification still increases Z.

The interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) has significant positive impact on Z with the coefficient of 1105.41.

##### Sub-period analysis:

The coefficient of non-interest-income diversification ( $H5$ ) is significantly positive (41.52) before the crisis while it becomes insignificant during the crisis. In addition, the interaction impact of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is negatively significant (-185.56) before the crisis while it becomes insignificant during the crisis.

**Summary for default risk** - Table 20 reports the summary of significant effects of diversifications and interactions for total period. Table 21 reports the summary of significant effects of diversifications and interactions for the sub-periods.

**Table 18: Summary of Significant Effects of Diversifications for Small BHCs**  
**for Total Period**

		<u>Market Risk</u>			
	Variable Abbreviation	MG	DL	MB	IRB
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3	+			
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5				
Off-balance-sheet Div. (OBSD)	H6		-	+	
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3	-			
Security Div. (SD)	H4*S4	-			
Non-interest-income Div. (NIID)	H5*S5				
Off-balance-sheet Div. (OBSD)	H6*S6		+	-	
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5				-
SD * OBSD	H4*H6		+	-	
All Activities	H2*H3*H4*H5*H6				

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

**Table 19: Summary of Significant Effects of Diversifications for Small BHCs**

**for Sub-periods**

		Market Risk							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
Variable	Abbreviation	MG	DL	MB	IRB	MG	DL	MB	IRB
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2					+			-
Loan Div. (LD)	H3								
Security Div. (SD)	H4					+		+	
Non-interest-income Div. (NIID)	H5		-						
Off-balance-sheet Div. (OBSD)	H6			+			-		
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2					-			+
Loan Div. (LD)	H3*S3								
Security Div. (SD)	H4*S4					-			
Non-interest-income Div. (NIID)	H5*S5							+	
Off-balance-sheet Div. (OBSD)	H6*S6	-	+	-			+		+
<b>Activity interaction</b>									
DGD * LD	H2*H3			-		+		-	
DGD * NIID	H2*H5							-	
SD * OBSD	H4*H6			-			+	-	
All Activities	H2*H3*H4*H5*H6							+	

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta



**Table 20: Summary of Significant Effects of Diversifications for Small BHCs  
for Total Period**

		<u>Default Risk</u>
	Variable Abbreviation	Z
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	+
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H2*H3*H4*H5*H6	+

Z: distance to default

**Table 21: Summary of Significant Effects of Diversifications for Small BHCs**  
for Sub-periods

		Default Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
Variable	Abbreviation	Z	Z
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5	+	
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5	-	
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

Z: distance to default

## **SUMMARY OF INDIVIDUAL DIVERSIFICATION AND INTERACTION EFFECTS FOR SMALL BHCs**

a. Total period: Table 22 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Non-interest-income diversification (H5) and the interaction of security diversification and security ratio (H4\*S4) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification (H4) and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Security diversification (H4) and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, non-interest-income diversification (H5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) and the interaction of domestic geographic and loan diversification (H2\*H3) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** – Non-interest-income diversification (H5) and the interaction of off-balance-sheet diversification, off-balance-sheet ratio (H6\*S6) and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with the (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**Table 22: Number and Percentage of Significant Effects of Diversifications and Interactions for Small BHCs for Total Period**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan Div. (LD)	H3	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Security Div. (SD)	H4	0	4	4	1	0	1	0	0	0	0	0	0	0	0	0	1	4	5
Non-interest-income Div. (NIID)	H5	2	0	2	0	2	2	1	0	1	0	0	0	0	0	0	3	2	5
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	1	1	1	1	2	0	0	0	1	2	3
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan Div. (LD)	H3*S3	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
Security Div. (SD)	H4*S4	2	0	2	0	0	0	0	0	0	1	0	1	1	0	1	4	0	4
Non-interest-income Div. (NIID)	H5*S5	0	2	2	2	0	2	0	0	0	0	0	0	0	0	0	2	2	4
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	1	1	1	0	1	1	1	2	0	0	0	2	2	4
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
DGD * NIID	H2*H5	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
SD * OBSD	H4*H6	0	0	0	0	0	0	1	0	1	1	1	2	0	0	0	2	1	3
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Loan Div. (LD)	H3	0	0	0	.	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	8	8	0.00
Security Div. (SD)	H4	0	100	100	0.00	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	8	33	42	0.24
Non-interest-income Div. (NIID)	H5	50	0	50	X	0	100	100	0.00	100	0	100	x	0	0	0	.	0	0	0	.	25	17	42	1.47
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	100	100	0.00	25	25	50	1.00	0	0	0	.	8	17	25	0.47
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Loan Div. (LD)	H3*S3	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	0	8	X
Security Div. (SD)	H4*S4	50	0	50	X	0	0	0	.	0	0	0	.	25	0	25	X	100	0	100	x	33	0	33	X
Non-interest-income Div. (NIID)	H5*S5	0	50	50	0.00	100	0	100	X	0	0	0	.	0	0	0	.	0	0	0	.	17	17	33	1.00
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	50	50	0.00	100	0	100	x	25	25	50	1.00	0	0	0	.	17	17	33	1.00
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	0	0	.	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
DGD * NIID	H2*H5	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	0	8	X
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	100	0	100	x	25	25	50	1.00	0	0	0	.	17	8	25	2.13
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	x	8	0	8	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

**For market risk** – The interaction of loan and loan ratio ( $H3*S3$ ), the interaction of security diversification and security ratio ( $H4*S4$ ) and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, loan diversification ( $H3$ ) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - The interaction of security diversification and security ratio ( $H4*S4$ ) and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts.

b. Before the crisis: Table 23 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Non-interest-income diversification ( $H5$ ) and the interaction of security diversification and security ratio ( $H4*S4$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification ( $H2$ ), security diversification ( $H4$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Security diversification ( $H4$ ) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, non-interest-income diversification ( $H5$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**Table 23: Number and Percentage of Significant Effects of Diversifications and Interactions for Small BHCs Before The Crisis**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Loan Div. (LD)	H3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Security Div. (SD)	H4	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	2
Non-interest-income Div. (NIID)	H5	2	0	2	0	1	1	1	0	1	1	0	1	1	0	1	5	1	6
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	2	2
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan Div. (LD)	H3*S3	0	2	2	0	0	0	0	1	1	0	0	0	0	0	0	0	3	3
Security Div. (SD)	H4*S4	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	2
Non-interest-income Div. (NIID)	H5*S5	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	1	0	1	2	1	3	0	0	0	1	4
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	1	1	2
DGD * NIID	H2*H5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1
SD * OBSD	H4*H6	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	2	0	2
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	0	25	25	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
Loan Div. (LD)	H3	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Security Div. (SD)	H4	0	25	25	0.00	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	8	8	17	1.00
Non-interest-income Div. (NIID)	H5	50	0	50	X	0	50	50	0.00	100	0	100	x	25	0	25	x	100	0	100	x	42	8	50	5.25
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	100	100	0.00	0	25	25	0.00	0	0	0	.	0	17	17	0.00
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Loan Div. (LD)	H3*S3	0	50	50	0.00	0	0	0	.	0	100	100	0.00	0	0	0	.	0	0	0	.	0	25	25	0.00
Security Div. (SD)	H4*S4	25	0	25	X	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	8	8	17	1.00
Non-interest-income Div. (NIID)	H5*S5	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	100	0	100	X	50	25	75	2.00	0	0	0	.	25	8	33	3.13
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	0	0	.	0	50	50	0.00	0	0	0	.	25	0	25	x	0	0	0	.	8	8	17	1.00
DGD * NIID	H2*H5	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	100	100	0.00	0	8	8	0.00
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	100	0	100	x	25	0	25	x	0	0	0	.	17	0	17	x
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

**For credit risk** - Non-interest-income diversification (H5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6) and the interaction of loan diversification and loan ratio (H3\*S3) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Non-interest-income diversification (H5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Non-interest-income diversification (H5) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

c. During the crisis: Table 24 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Loan diversification (H3), non-interest-income diversification (H5), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3) and the interaction of non-interest-income

diversification and non-interest-income ratio ( $H5*S5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** – No diversifications relatively advantage BHCs. However, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - non-interest-income diversification ( $H5$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Off-balance-sheet diversification ( $H6$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** – No diversifications or their interactions advantage BHCs.



**Table 24: Number and Percentage of Significant Effects of Diversifications and Interactions for Small BHCs During The Crisis**

(Number)	Variable Abbreviation	(n=4) Accounting Returns			(n=2) Market Returns			(n=1) Credit Risk			(n=4) Market Risk			(n=1) Default Risk			(n=12) All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
Activity diversification																			
Domestic Geographic Div. (DGD)	H2	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2
Loan Div. (LD)	H3	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Security Div. (SD)	H4	0	0	0	0	0	0	0	1	1	0	2	2	0	0	0	0	3	3
Non-interest-income Div. (NIID)	H5	3	0	3	0	0	0	1	0	1	0	0	0	0	0	0	4	0	4
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
Scale interaction																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	1	1	0	0	0	1	1	2	0	0	0	1	2	3
Loan Div. (LD)	H3*S3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Security Div. (SD)	H4*S4	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	2	0	2
Non-interest-income Div. (NIID)	H5*S5	0	3	3	0	0	0	0	1	1	0	1	1	0	0	0	0	5	5
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	2	2
Activity interaction																			
DGD * LD	H2*H3	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2
DGD * NIID	H2*H5	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
SD * OBSD	H4*H6	0	0	0	0	0	0	1	0	1	1	1	2	0	0	0	2	1	3
All Activities	H2*H3*H4*H5*H6	2	0	2	0	1	1	1	0	1	0	1	1	0	0	0	3	2	5

( % )	Variable Abbreviation	Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
		+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
Domestic Geographic Div. (DGD)	H2	0	0	0	.	0	0	0	.	0	0	0	.	25	25	50	1.00	0	0	0	.	8	8	17	1.00
Loan Div. (LD)	H3	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Security Div. (SD)	H4	0	0	0	.	0	0	0	.	0	100	100	0.00	0	50	50	0.00	0	0	0	.	0	25	25	0.00
Non-interest-income Div. (NIID)	H5	75	0	75	x	0	0	0	.	100	0	100	X	0	0	0	.	0	0	0	.	33	0	33	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	0	8	X
Scale interaction																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	50	50	0.00	0	0	0	.	25	25	50	1.00	0	0	0	.	8	17	25	0.47
Loan Div. (LD)	H3*S3	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Security Div. (SD)	H4*S4	0	0	0	.	0	0	0	.	100	0	100	X	25	0	25	X	0	0	0	.	17	0	17	X
Non-interest-income Div. (NIID)	H5*S5	0	75	75	0.00	0	0	0	.	0	100	100	0.00	0	25	25	0.00	0	0	0	.	0	42	42	0.00
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	0	0	.	0	50	50	0.00	0	0	0	.	0	17	17	0.00
Activity interaction																									
DGD * LD	H2*H3	0	0	0	.	0	0	0	.	0	0	0	.	25	25	50	1.00	0	0	0	.	8	8	17	1.00
DGD * NIID	H2*H5	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	0	8	X
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	100	0	100	x	25	25	50	1.00	0	0	0	.	17	8	25	2.13
All Activities	H2*H3*H4*H5*H6	50	0	50	x	0	50	50	0.00	100	0	100	x	0	25	25	0.00	0	0	0	.	25	17	42	1.47

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".



## 2. LARGER COMMUNITY BHCs

### 2.1 Accounting returns

(a) **Return on asset (ROA)** –Appendix 13 reports the statistical results.

Total period:

All types of diversification have significant impacts on ROA. The impact of domestic geographic diversification is negative, the impact of loan diversification is positive, the impact of security diversification is negative, the impact of non-interest-income diversification is positive, and the impact of off-balance-sheet diversification is negative. The coefficient on domestic geographic diversification (H2) is -0.0218. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to ROA with the coefficient of 0.0190. Even if S2 were 1, the net impact of  $-0.0218 + 0.0190 * S2$  would still be negative. Therefore, the impact of domestic geographic diversification is negative.

The coefficient on loan diversification (H3) is 0.0095. However the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to ROA with the coefficient of -0.0143. Therefore, greater loan diversification could still reduce ROA with negative net impact of  $0.0095 - 0.0143 * S3$  if S3 is greater than 0.4126. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on security diversification (H4) is -0.0028. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROA with the coefficient of 0.0060. Therefore, greater security diversification could still improve ROA with positive net impact of  $-0.0028 + 0.0060 * S4$  if S4 is greater than 0.4667. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the

impact turns from negative to positive.

The coefficient on non-interest-income diversification (H5) is 0.0036. The coefficient on off-balance-sheet diversification (H6) is -0.0018. There are no significant scale interaction effects for them.

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant positive impact on ROA with the coefficient of 0.0077.

#### Sub-period analysis:

Both the coefficients of domestic geographic diversification (H2) before and during the crisis are significantly negative (-0.0173 and -0.0281, respectively). However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to ROA with the coefficient of 0.0302 during the crisis. Therefore, greater domestic geographic diversification could still increase ROA with positive net impact of  $-0.0281 + 0.0302 * S2$  if  $S2$  is greater than 0.9305. The results show that the sign of the impact of non-interest-income diversification depends on the scale of domestic geographic ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Both the coefficients of loan diversification (H3) before and during the crisis are significantly positive (0.0115 and 0.0087, respectively). However the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to ROA with the coefficient of -0.0178 before the crisis. Therefore, greater loan diversification could still reduce ROA with negative net impact of  $0.0115 - 0.0178 * S3$  if  $S3$  is greater than 0.6461. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient of security diversification (H4) is significantly negative (-0.0027) before the crisis while it becomes insignificant during the crisis. Moreover, the

interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROA with the coefficient of 0.0057 during the crisis. Therefore, greater security diversification could still increase ROA with positive net impact of  $-0.0027 + 0.0057 * S4$  if S4 is greater than 0.4737. The results show that the sign of the impact of security diversification depends on the scale of security ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Both the coefficients of non-interest-income diversification (H5) before and during the crisis are significantly positive (0.0038 and 0.0033, respectively). However the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to ROA with the coefficient of -0.3337 before the crisis. Therefore, greater non-interest-income diversification could still reduce ROA with negative net impact of  $0.0038 - 0.3337 * S5$  if S5 is greater than 0.0114. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

Although both the coefficients of off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to ROA with the coefficient of -0.0071 during the crisis. Therefore, off-balance-sheet diversification still reduces ROA during the crisis.

(b) **Risk-adjusted return on asset (RAROA)** –Appendix 14 reports the statistical results.

Total period:

Only non-interest-income diversification (H5) has significant impact on RAROA. The impact is positive with the coefficient of 1.6173.

Sub-period analysis:

Both the coefficients of domestic geographic diversification (H2) and security diversification (H4) are insignificant before the crisis while they become positively significant during the crisis (14.4625 and 6.1264, respectively).

Although the interaction impact of domestic geographic and loan diversifications (H2\*H3) and the interaction impact of all-activity diversification (H2\*H3\*H4\*H5\*H6) on RAROA are insignificant before the crisis but they become negatively significant (-59.9694).

(c) **Return on equity (ROE)** –Appendix 15 reports the statistical results.

Total period:

Two types of diversification have significant impacts on ROE. Both the impacts of domestic geographic diversification and security diversification are negative. The coefficient on domestic geographic diversification (H2) is -0.0887. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to ROE with the coefficient of 0.0861. Even if S2 were 1, the net impact of  $-0.0887 + 0.0861 * S2$  would still be negative. Therefore, the impact of domestic geographic diversification is negative. The coefficient on security diversification (H4) is -0.0113

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant positive impact on ROE with the coefficient of 0.0372.

Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes negatively significant (-0.2591) during the crisis. Moreover, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to ROE with the coefficient of 0.2704 during the crisis.

Therefore, greater domestic geographic diversification could still improve ROE with positive net impact of  $-0.2591 + 0.2704 * S2$  if  $S2$  is greater than 0.9583. The results show that the sign of the impact of domestic geographic diversification depends on the scale of domestic geographic ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on security diversification (H4) is significantly negative (-0.0073) before the crisis while it becomes insignificant during the crisis.

Although both the coefficient of off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to ROE with the coefficient of -0.1320 during the crisis. Therefore, off-balance-sheet diversification still reduces ROE during the crisis.

The coefficient on the interaction effect of domestic geographic and non-interest-income diversification ( $H2*H5$ ) is significantly positive (0.0191) before the crisis while it become insignificant during the crisis.

**(d) Risk-adjusted return on equity (RAROE)** –Appendix 16 reports the statistical results.

Total period:

Only non-interest-income diversification (H5) has significant impact on RAROE. The impact is positive with the coefficient of 1.5922.

Sub-period analysis:

The coefficients of domestic geographic diversification (H2), loan diversification (H3), security diversification (H4) and non-interest-income diversification (H5) are insignificant before the crisis while they become positively significant during the crisis (11.0993, 14.6937, 4.8504 and 2.4995, respectively).

For interaction effects of diversifications, none of them are significant before the crisis. However, during the crisis the coefficient on all-activity diversification ( $H2*H3*H4*H5*H6$ ) is significantly negative (-51.0833).

**Summary for accounting returns** - Table 25 reports the summary of significant effects of diversifications and interactions for total period. Table 26 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## 2.2 Market returns

(a) **Stock return (SR)** –Appendix 17 reports the statistical results.

### Total period:

None of the diversifications have significant impacts on SR. In addition, all interaction effects of diversifications are insignificant.

### Sub-period analysis:

Similarly, all individual diversifications and interactions of diversifications are insignificant.

(b) **Risk-adjusted stock return (RASR)** –Appendix 18 reports the statistical results.

### Total period:

Only loan diversification ( $H3$ ) has significant impact on RASR. The impact is positive with the coefficient of 1.4598.

### Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) is significantly positive (1.7786) before the crisis, while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to RASR with the coefficient of -2.8768 before the crisis. Therefore, greater loan diversification could still reduce RASR with negative net impact of  $1.7786 - 2.8768 * S3$



**Table 25: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Total Period**

		<u>Accounting Returns</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2	-		-	
Loan Div. (LD)	H3	+			
Security Div. (SD)	H4	-		-	
Non-interest-income Div. (NIID)	H5	+	+		+
Off-balance-sheet Div. (OBSD)	H6	-			
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2	+		+	
Loan Div. (LD)	H3*S3	-			
Security Div. (SD)	H4*S4	+			
Non-interest-income Div. (NIID)	H5*S5				
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5	+		+	
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				
ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity					
RAROE: risk-adjusted return on equity					

**Table 26: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Sub-periods**

Accounting Returns									
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable	ROA	RAROA	ROE	RAROE	ROA	RAROA	ROE	RAROE
	Abbreviation								
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2	-				-	+	-	+
Loan Div. (LD)	H3	+				+			+
Security Div. (SD)	H4	-		-			+		+
Non-interest-income Div. (NIID)	H5	+	+			+	+		+
Off-balance-sheet Div. (OBSD)	H6								
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2					+		+	
Loan Div. (LD)	H3*S3	-							
Security Div. (SD)	H4*S4	+							
Non-interest-income Div. (NIID)	H5*S5	-					+	+	+
Off-balance-sheet Div. (OBSD)	H6*S6					-		-	
<b>Activity interaction</b>									
DGD * LD	H2*H3						-		
DGD * NIID	H2*H5			+					
SD * OBSD	H4*H6								
All Activities	H2*H3*H4*H5*H6								-
ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity									
RAROE: risk-adjusted return on equity									

if  $S3$  is greater than 0.6183. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on the interaction effect of domestic geographic and non-interest-income diversification ( $H2*H5$ ) is significantly positive (1.2065) before the crisis while it becomes significantly negative (-5.9382) during the crisis.

**Summary for market returns** - Table 27 reports the summary of significant effects of diversifications and interactions for total period. Table 28 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 2.3 Credit risk

**Net charge-offs (NCO)** –Appendix 19 reports the statistical results.

#### Total period:

Two types of diversification have significant impacts on NCO. The impact of non-interest-income diversification ( $H5$ ) is negative (-0.0013) while the impact of off-balance-sheet diversification ( $H6$ ) is positive (0.0009).

The interaction of domestic geographic and loan diversifications ( $H2*H3$ ) has significant positive impact on NCO with the coefficient of 0.0038. The interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) also has significant positive impact with the coefficient of 0.0026. However, the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) has significant negative impact with the coefficient of -0.0017.

#### Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) before the crisis is insignificant while it becomes negatively significant during the crisis (-0.0081). Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and positively related to NCO

**Table 27: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Total Period**

		<u>Market Returns</u>	
	Variable Abbreviation	SR	RASR
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		+
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5		
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5		
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

SR: stock return      RASR: risk-adjusted stock return

**Table 28: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Sub-periods**

Variable Abbreviation		Market Returns			
		<u>Before The Crisis</u>		<u>During The Crisis</u>	
		SR	RASR	SR	RASR
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3		+		
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5				
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3		-		
Security Div. (SD)	H4*S4				
Non-interest-income Div. (NIID)	H5*S5				
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5		+		-
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				

SR: stock return      RASR: risk-adjusted stock return

with the coefficient of 0.0110 during the crisis. Therefore, greater loan diversification could still increase NCO with positive net impact of  $-0.0081 + 0.0110 * S3$  if  $S3$  is greater than 0.7364. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on the interaction effect of domestic geographic and loan diversification ( $H2 * H3$ ) is significantly positive (0.0035) before the crisis while it becomes insignificant during the crisis.

**Summary for credit risk** - Table 29 reports the summary of significant effects of diversifications and interactions for total period. Table 30 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## 2.4 Market risk

(a) **Maturity gap (MG)** –Appendix 20 reports the statistical results.

### Total period:

Three types of diversification have significant impacts on ROA. The impacts of domestic geographic diversification and non-interest-income diversification are negative, while the impact of off-balance-sheet diversification is positive. The coefficient on domestic geographic diversification ( $H2$ ) is -0.2527. Although individual non-interest-income diversification ( $H5$ ) and off-balance-sheet diversification ( $H6$ ) have no significant impact on MG, they still have impacts on MG. The interaction of non-interest-income diversification and non-interest-income ratio ( $H5 * S5$ ) is significantly and negatively related to MG with the coefficient of -1.7185. Therefore, non-interest-income diversification still reduces MG. The interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6 * S6$ ) is significantly and positively related to MG with the coefficient of 0.0719. Therefore, off-balance-sheet diversification still

**Table 29: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Total Period**

		<u>Credit Risk</u>
	Variable Abbreviation	NCO
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	-
Off-balance-sheet Div. (OBSD)	H6	+
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
DGD * LD	H2*H3	+
DGD * NIID	H2*H5	+
SD * OBSD	H4*H6	-
All Activities	H2*H3*H4*H5*H6	

NCO: net charge-offs

**Table 30: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Sub-periods**

		Credit Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	NCO	NCO
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		-
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5	-	
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		+
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		-
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3	+	
DGD * NIID	H2*H5	+	+
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

NCO: net charge-offs



increases MG.

The interaction of domestic geographic and loan diversifications ( $H2*H3$ ) has significant positive impact on MG with the coefficient of 0.1655. The interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) has significant negative impact with the coefficient of -0.1072. The interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) also has significant negative impact on MG with the coefficient of -1.0025.

#### Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) is insignificant before the crisis while it becomes positively significant during the crisis (0.5034). Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to MG with the coefficient of -0.7812 during the crisis. Therefore, greater loan diversification could still reduce MG with negative net impact of  $0.5034 - 0.7812 * S3$  if  $S3$  is greater than 0.6444. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from positive to negative.

Both the coefficients on security diversification ( $H4$ ) are insignificant before and during the crisis. However, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to MG with the coefficient of 0.4964 during the crisis. Therefore, security diversification still increases MG.

The interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to MG with the coefficient of 0.0952 before the crisis. Therefore, off-balance-sheet diversification still increases MG. However, the impact of off-balance-sheet diversification becomes insignificant during the crisis.

The coefficient on the interaction effect of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly positive (0.2570) before the

crisis. In addition, the coefficients on the interaction effect of security and off-balance-sheet diversifications ( $H4*H6$ ) and on the interaction effect of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) are significantly negative (-0.1210 and -1.2204, respectively) before the crisis. However, all of them become insignificant during the crisis.

(b) **Derivatives loss (DL)** –Appendix 21 reports the statistical results.

Total period:

Three types of diversification have significant impacts on DL. They are security diversification, non-interest-income diversification and off-balance-sheet diversification. Although individual security diversification ( $H4$ ) has no significant impact, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to DL with the coefficient of 0.0001. Therefore, security diversification still increases DL. Although individual non-interest-income diversification ( $H5$ ) has no significant impact, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and negatively related to DL with the coefficient of -0.0020. Therefore, non-interest-income diversification still reduces DL. In addition, the coefficient on off-balance-sheet diversification ( $H6$ ) is -0.0001. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to DL with the coefficient of 0.0004. Therefore, greater off-balance-sheet diversification could still increase DL with positive net impact of  $-0.0001 + 0.0004 * S6$  if  $S6$  is greater than 0.25. The results show that the sign of the impact of off-balance-sheet diversification depends on the scale of off-balance-sheet ratio. If the ratio is large enough, the impact turns from negative to positive.

Sub-period analysis:

The coefficient on domestic geographic diversification ( $H2$ ) is insignificant before the

crisis while it becomes positively significant (0.0003) during the crisis. Moreover, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and negatively related to DL with the coefficient of -0.0006 during the crisis. Therefore, greater domestic geographic diversification could still reduce DL with negative net impact of  $0.0003 - 0.0006 * S2$  if  $S2$  is greater than 0.5. The results show that the sign of the impact of domestic geographic diversification depends on the scale of domestic geographic ratio during the crisis. If the ratio is large enough, the impact turns from positive to negative.

Although both the coefficients of security diversification ( $H4$ ) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to DL with the coefficient of 0.0001 before the crisis. Therefore, security diversification still increases DL before the crisis.

(c) **Market beta (MB)** –Appendix 22 reports the statistical results.

Total period:

Two types of diversification have significant impacts on MB. Both impacts of non-interest-income diversification and off-balance-sheet diversification are negative. The coefficient on non-interest-income diversification ( $H5$ ) is -0.1240. Although individual off-balance-sheet diversification ( $H6$ ) has no significant impact, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to MB with the coefficient of -0.1091. Therefore, off-balance-sheet diversification still reduces DL.

Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) is insignificant before the crisis while it becomes negatively significant during the crisis (-2.9451). Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and positively related to MB

with the coefficient of 4.8295 during the crisis. Therefore, greater loan diversification could still increase MB with positive net impact of  $-2.9451 + 4.8295 * S3$  if  $S3$  is greater than 0.6099. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients of non-interest-income diversification (H5) are insignificant before and during the crisis, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to MB with the coefficient of 89.4688 during the crisis. Therefore, non-interest-income diversification still increases MB during the crisis.

Although both the coefficients of off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to MB with the coefficient of -0.2247 before the crisis. Therefore, off-balance-sheet diversification still reduces MB before the crisis.

For interaction effects of diversifications, none of them are significant before the crisis. However, during the crisis the coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is significantly negative (-2.0104) and the coefficient on the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) is significantly positive (1.3731). Therefore, the interaction of domestic geographic and loan diversifications and the interaction of domestic geographic and non-interest-income diversifications still have impact on MB during the crisis.

(d) **Interest rate beta (IRB)** –Appendix 23 reports the statistical results.

Total period:

Two types of diversification have significant impacts on IRB. They are loan diversification and security diversification. Although individual loan diversification (H3)

has no significant impact, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to IRB with the coefficient of -0.7688. Therefore, loan diversification still reduces IRB. In addition, although individual security diversification ( $H4$ ) has no significant impact, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to IRB with the coefficient of 0.3981. Therefore, security diversification still increases IRB.

The interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) has significant negative impact on IRB with the coefficient of -0.8023.

#### Sub-period analysis:

There are no significant differences on the effects of diversifications and interactions before and during the crisis.

**Summary for market risk** - Table 31 reports the summary of significant effects of diversifications and interactions for total period. Table 32 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## 2.5 Default risk

**Distance to default (Z-score)** –Appendix 24 reports the statistical results.

#### Total period:

Only non-interest-income diversification ( $H5$ ) has significant impact on Z. The impact is positive with the coefficient of 45.73.

#### Sub-period analysis:

The coefficient on domestic geographic diversification ( $H2$ ) and the coefficient on loan diversification are insignificant before the crisis while they become positively significant during the crisis (573.78 and 197.38, respectively).

The interaction impact of domestic geographic and loan diversifications ( $H2*H3$ ) is insignificant before the crisis while it becomes negatively significant (-910.83) during the

**Table 31: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Total Period**

		<u>Market Risk</u>			
	Variable Abbreviation	MG	DL	MB	IRB
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2	-			
Loan Div. (LD)	H3				
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5			-	
Off-balance-sheet Div. (OBSD)	H6		-		
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3				-
Security Div. (SD)	H4*S4		+		+
Non-interest-income Div. (NIID)	H5*S5	-	-		
Off-balance-sheet Div. (OBSD)	H6*S6	+	+	-	
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5	+			
SD * OBSD	H4*H6	-			
All Activities	H2*H3*H4*H5*H6	-			

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

**Table 32: Summary of Significant Effects of Diversifications for Larger**

**Community BHCs for Sub-periods**

		Market Risk							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
Variable	Abbreviation	MG	DL	MB	IRB	MG	DL	MB	IRB
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2	-				-	+		
Loan Div. (LD)	H3					+			-
Security Div. (SD)	H4								
Non-interest-income Div. (NIID)	H5					-			
Off-balance-sheet Div. (OBSD)	H6		-						
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2						-		
Loan Div. (LD)	H3*S3					-		+	
Security Div. (SD)	H4*S4		+		+	+			+
Non-interest-income Div. (NIID)	H5*S5	-				-		+	
Off-balance-sheet Div. (OBSD)	H6*S6	+	+	-			+		
<b>Activity interaction</b>									
DGD * LD	H2*H3						+	-	
DGD * NIID	H2*H5	+	-				+	+	
SD * OBSD	H4*H6	-							
All Activities	H2*H3*H4*H5*H6	-					-		

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

crisis.

**Summary for default risk** - Table 33 reports the summary of significant effects of diversifications and interactions for total period. Table 34 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## **SUMMARY OF DIVERSIFICATION AND INTERACTION EFFECTS FOR LARGER COMMUNITY BHCs**

a. Total period: Table 35 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Loan diversification (H3), non-interest-income diversification (H5), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of security diversification and security ratio (H4\*S4), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2), security diversification (H4), off-balance-sheet diversification (H6), and the interaction of loan diversification and loan ratio (H3\*S3) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Loan diversification (H3) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts.

**For credit risk** - Non-interest-income diversification (H5) and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than



**Table 33: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Total Period**

		<u>Default Risk</u>
	Variable Abbreviation	Z
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	+
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H2*H3*H4*H5*H6	

Z: distance to default

**Table 34: Summary of Significant Effects of Diversifications for Larger  
Community BHCs for Sub-periods**

		Default Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	Z	Z
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		+
Loan Div. (LD)	H3		
Security Div. (SD)	H4		+
Non-interest-income Div. (NIID)	H5	+	+
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		+
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		-
DGD * NIID	H2*H5		
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

Z: distance to default

one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Domestic geographic diversification (H2), non-interest-income diversification (H5), off-balance-sheet diversification (H6), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of security and off-balance-sheet diversifications (H4\*H6), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of security diversification and security ratio (H4\*S4), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Non-interest-income diversification (H5) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts.

b. Before the crisis: Table 36 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Loan diversification (H3), non-interest-income diversification (H5), the interaction of security diversification and security ratio (H4\*S4), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2), security diversification (H4), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) hurt BHCs with their (+/-) ratios less than one,

**Table 35: Number and Percentage of Significant Effects of Diversifications and Interactions for Larger Community BHCs for Total Period**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
Activity diversification																			
Domestic Geographic Div. (DGD)	H2	0	2	2	0	0	0	0	0	0	1	0	1	0	0	0	1	2	3
Loan Div. (LD)	H3	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	2	0	2
Security Div. (SD)	H4	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Non-interest-income Div. (NIID)	H5	3	0	3	0	0	0	1	0	1	1	0	1	1	0	1	6	0	6
Off-balance-sheet Div. (OBSD)	H6	0	1	1	0	0	0	0	1	1	1	0	1	0	0	0	1	2	3
Scale interaction																			
Domestic Geographic Div. (DGD)	H2*S2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Loan Div. (LD)	H3*S3	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	2
Security Div. (SD)	H4*S4	1	0	1	0	0	0	0	0	0	0	2	2	0	0	0	1	2	3
Non-interest-income Div. (NIID)	H5*S5	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	2	0	2
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	1	2	3
Activity interaction																			
DGD * LD	H2*H3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1
DGD * NIID	H2*H5	2	0	2	0	0	0	0	1	1	0	1	1	0	0	0	2	2	4
SD * OBSD	H4*H6	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	2	0	2
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
Domestic Geographic Div. (DGD)	H2	0	50	50	0.00	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	17	25	0.47
Loan Div. (LD)	H3	25	0	25	X	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Security Div. (SD)	H4	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Non-interest-income Div. (NIID)	H5	75	0	75	X	0	0	0	.	100	0	100	x	25	0	25	x	100	0	100	x	50	0	50	X
Off-balance-sheet Div. (OBSD)	H6	0	25	25	0.00	0	0	0	.	0	100	100	0.00	25	0	25	x	0	0	0	.	8	17	25	0.47
Scale interaction																									
Domestic Geographic Div. (DGD)	H2*S2	50	0	50	X	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Loan Div. (LD)	H3*S3	0	25	25	0.00	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	8	17	1.00
Security Div. (SD)	H4*S4	25	0	25	X	0	0	0	.	0	0	0	.	0	50	50	0.00	0	0	0	.	8	17	25	0.47
Non-interest-income Div. (NIID)	H5*S5	0	0	0	.	0	0	0	.	0	0	0	.	50	0	50	X	0	0	0	.	17	0	17	X
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	0	0	.	25	50	75	0.50	0	0	0	.	8	17	25	0.47
Activity interaction																									
DGD * LD	H2*H3	0	0	0	.	0	0	0	.	0	100	100	0.00	0	0	0	.	0	0	0	.	0	8	8	0.00
DGD * NIID	H2*H5	50	0	50	x	0	0	0	.	0	100	100	0.00	0	25	25	0.00	0	0	0	.	17	17	33	1.00
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	100	0	100	x	25	0	25	x	0	0	0	.	17	0	17	x
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	0	8	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

**Table 36: Number and Percentage of Significant Effects of Diversifications and Interactions for Larger Community BHCs Before The Crisis**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	2
Loan Div. (LD)	H3	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	2	0	2
Security Div. (SD)	H4	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Non-interest-income Div. (NIID)	H5	2	0	2	0	0	0	1	0	1	0	0	0	1	0	1	4	0	4
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan Div. (LD)	H3*S3	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	2	2
Security Div. (SD)	H4*S4	1	0	1	0	0	0	0	0	0	0	2	2	0	0	0	1	2	3
Non-interest-income Div. (NIID)	H5*S5	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	2
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	1	2	3
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1
DGD * NIID	H2*H5	1	0	1	1	0	1	0	1	1	1	1	2	0	0	0	3	2	5
SD * OBSD	H4*H6	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	0	25	25	0.00	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	8	17	1.00
Loan Div. (LD)	H3	25	0	25	X	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Security Div. (SD)	H4	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Non-interest-income Div. (NIID)	H5	50	0	50	X	0	0	0	.	100	0	100	x	0	0	0	.	100	0	100	x	33	0	33	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	0	8	X
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Loan Div. (LD)	H3*S3	0	25	25	0.00	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Security Div. (SD)	H4*S4	25	0	25	X	0	0	0	.	0	0	0	.	0	50	50	0.00	0	0	0	.	8	17	25	0.47
Non-interest-income Div. (NIID)	H5*S5	0	25	25	0.00	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	8	17	1.00
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	0	0	.	25	50	75	0.50	0	0	0	.	8	17	25	0.47
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	0	0	.	0	0	0	.	0	100	100	0.00	0	0	0	.	0	0	0	.	0	8	8	0.00
DGD * NIID	H2*H5	25	0	25	x	50	0	50	x	0	100	100	0.00	25	25	50	1.00	0	0	0	.	25	17	42	1.47
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	0	8	x
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	0	8	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Loan diversification (H3) and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Non-interest-income diversification (H5) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic and loan diversifications (H2\*H3) and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Domestic geographic diversification (H2), off-balance-sheet diversification (H6), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of security and off-balance-sheet diversifications (H4\*H6), and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of security diversification and security ratio (H4\*S4) and the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Non-interest-income diversification (H5) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts.

c. During the crisis: Table 37 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Loan diversification (H3), security diversification (H4), non-interest-income diversification (H5), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts.

However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** – No diversifications or interactions advantage BHCs. However, the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Loan diversification (H3) and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts.

However, the interaction of loan diversification and loan ratio (H3\*S3) and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Non-interest-income diversification (H5), non-interest-income diversification (H5), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating

**Table 37: Number and Percentage of Significant Effects of Diversifications and Interactions for Larger Community BHCs During The Crisis**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	2	2	4	0	0	0	0	0	0	1	1	2	1	0	1	4	3	7
Loan Div. (LD)	H3	2	0	2	0	0	0	1	0	1	1	1	2	0	0	0	4	1	5
Security Div. (SD)	H4	2	0	2	0	0	0	0	0	0	0	0	0	1	0	1	3	0	3
Non-interest-income Div. (NIID)	H5	3	0	3	0	0	0	0	0	0	1	0	1	1	0	1	5	0	5
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	2	0	2	0	0	0	0	0	0	1	0	1	0	0	0	3	0	3
Loan Div. (LD)	H3*S3	0	0	0	0	0	0	0	1	1	1	1	2	0	0	0	1	2	3
Security Div. (SD)	H4*S4	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	2	2
Non-interest-income Div. (NIID)	H5*S5	3	0	3	0	0	0	1	0	1	1	1	2	1	0	1	6	1	7
Off-balance-sheet Div. (OBSD)	H6*S6	0	2	2	0	0	0	0	0	0	0	1	1	0	0	0	0	3	3
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	1	1	0	0	0	0	0	0	1	1	2	0	1	1	1	3	4
DGD * NIID	H2*H5	0	0	0	0	1	1	0	1	1	0	2	2	0	0	0	0	4	4
SD * OBS	H4*H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Activities	H2*H3*H4*H5*H6	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	2

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	50	50	100	1.00	0	0	0	.	0	0	0	.	25	25	50	1.00	100	0	100	x	33	25	58	1.32
Loan Div. (LD)	H3	50	0	50	X	0	0	0	.	100	0	100	x	25	25	50	1.00	0	0	0	.	33	8	42	4.13
Security Div. (SD)	H4	50	0	50	X	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	x	25	0	25	X
Non-interest-income Div. (NIID)	H5	75	0	75	X	0	0	0	.	0	0	0	.	25	0	25	X	100	0	100	x	42	0	42	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	50	0	50	X	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	25	0	25	X
Loan Div. (LD)	H3*S3	0	0	0	.	0	0	0	.	0	100	100	0.00	25	25	50	1.00	0	0	0	.	8	17	25	0.47
Security Div. (SD)	H4*S4	0	0	0	.	0	0	0	.	0	0	0	.	0	50	50	0.00	0	0	0	.	0	17	17	0.00
Non-interest-income Div. (NIID)	H5*S5	75	0	75	X	0	0	0	.	100	0	100	X	25	25	50	1.00	100	0	100	x	50	8	58	6.25
Off-balance-sheet Div. (OBSD)	H6*S6	0	50	50	0.00	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	25	25	0.00
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	25	25	0.00	0	0	0	.	0	0	0	.	25	25	50	1.00	0	100	100	0.00	8	25	33	0.32
DGD * NIID	H2*H5	0	0	0	.	0	50	50	0.00	0	100	100	0.00	0	50	50	0.00	0	0	0	.	0	33	33	0.00
SD * OBS	H4*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
All Activities	H2*H3*H4*H5*H6	0	25	25	0.00	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	8	17	1.00

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".



that favorable impacts dominate unfavorable impacts. However, the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Domestic geographic diversification ( $H2$ ), security diversification ( $H4$ ), non-interest-income diversification ( $H5$ ), and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

### 3 REGIONAL BHCs

#### 3.1 Accounting returns

(a) **Return on asset (ROA)** –Appendix 25 reports the statistical results.

##### Total period:

Only off-balance-sheet diversification has significant positive impact on ROA. Although individual off-balance-sheet diversification ( $H6$ ) has no significant impact on ROA, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to ROA with the coefficient of 0.0035. Therefore, off-balance-sheet diversification still improves ROA.

##### Sub-period analysis:

The net impacts of non-interest-income and off-balance-sheet diversifications are

positively significant before the crisis while they become insignificant during the crisis. Although individual non-interest-income diversification (H5) and off-balance-sheet diversification (H6) have no significant impact on ROA, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) and the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) are significantly and positively related to ROA with the coefficients of 0.1294 and 0.0020, respectively. Therefore, both non-interest-income diversification and off-balance-sheet diversification still improve ROA.

The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is significantly positive (0.0070) before the crisis while it becomes insignificant during the crisis.

(b) **Risk-adjusted return on asset (RAROA)** –Appendix 26 reports the statistical results.

Total period:

Three types of diversification have significant impacts on RAROA. They are domestic geographic diversification, loan diversification and security diversification. The coefficient on domestic geographic diversification (H2) is 24.3230. The coefficient on loan diversification (H3) is 34.9827. However the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to RAROA with the coefficient of -43.8865. Therefore, greater loan diversification could still reduce RAROA with negative net impact of  $34.9827 - 43.8865 * S3$  if  $S3$  is greater than 0.7972. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio. If the ratio is large enough, the impact turns from positive to negative. In addition, the coefficient on security diversification (H4) is -22.5666. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to RAROA with the coefficient of 135.3170. Therefore, greater security diversification

could still improve RAROA with positive net impact of  $-22.5666 + 135.3170 * S4$  if  $S4$  is greater than 0.1668. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly positive (40.1485) before the crisis while it becomes insignificant during the crisis. The coefficient on loan diversification (H3) is significantly positive (56.1155) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to RAROA with the coefficient of -63.0398 before the crisis. Therefore, greater loan diversification could still reduce RAROA with negative net impact of  $56.1155 - 63.0398 * S3$  if  $S3$  is greater than 0.8902. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative. In addition, the coefficient on security diversification (H4) is significantly negative (-23.9513) before the crisis while it becomes insignificant during the crisis. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to RAROA with the coefficient of 154.0378 during the crisis. Therefore, greater security diversification could still improve RAROA with positive net impact of  $-23.9513 + 154.0378 * S4$  if  $S4$  is greater than 0.1555. The results show that the sign of the impact of security diversification depends on the scale of security ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients of off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related

to RAROA with the coefficient of -24.8881 during the crisis. Therefore, off-balance-sheet diversification still decreases RAROA during the crisis.

(c) **Return on equity (ROE)** –Appendix 27 reports the statistical results.

Total period:

Only off-balance-sheet diversification has significant positive net impact on ROE. Although individual off-balance-sheet diversification (H6) has no significant impact on ROE, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and positively related to ROE with the coefficient of 0.0237. Therefore, off-balance-sheet diversification still improves ROE.

Sub-period analysis:

The coefficient on non-interest-income diversification (H5) is significantly positive (0.0277) before the crisis while it becomes insignificant during the crisis. Although both the coefficients of off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and positively related to ROE with the coefficient of 0.0295 before the crisis. Therefore, off-balance-sheet diversification still improves ROE before the crisis.

The coefficient on the interaction effect of domestic geographic and loan diversifications (H2\*H3) is significantly positive (0.0910) before the crisis while it becomes insignificant during the crisis.

(d) **Risk-adjusted return on equity (RAROE)** –Appendix 28 reports the statistical results.

Total period:

Two types of diversification have significant impacts on RAROE. The impact of domestic geographic diversification (H2) is positive (32.0934). The impact of security

diversification (H4) is negative (-21.4558). However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to RAROE with the coefficient of 144.3751. Therefore, greater security diversification could still improve RAROE with positive net impact of  $-21.4558 + 144.3751 * S4$  if S4 is greater than 0.1487. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant negative impact on RAROE with the coefficient of -28.0217.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly positive (34.6007) before the crisis while it becomes insignificant during the crisis.

The coefficient on loan diversification (H3) is significantly positive (53.0765) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to RAROE with the coefficient of -77.1311 before the crisis. Therefore, greater loan diversification could still reduce RAROE with negative net impact of  $53.0765 - 77.1311 * S3$  if S3 is greater than 0.6882. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on security diversification (H4) is significantly negative (-25.3459) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to RAROE with the coefficient of 167.9160 before the crisis. Therefore, greater security diversification could still improve RAROE with positive net impact of  $-25.3459 + 167.9160 * S4$  if S4 is greater than 0.1510. The results show that the sign

of the impact of security diversification depends on the scale of security ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients of off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to RAROE with the coefficient of -17.7129 during the crisis. Therefore, off-balance-sheet diversification still reduces RAROE during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) is significantly negative (-37.2144) before the crisis while it becomes insignificant during the crisis

**Summary for accounting returns** - Table 38 reports the summary of significant effects of diversifications and interactions for total period. Table 39 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 3.2 Market returns

(a) **Stock return (SR)** –Appendix 29 reports the statistical results.

#### Total period:

Two types of diversification have significant impacts on SR. Both the impacts of domestic geographic diversification (H2) and non-interest-income diversification (H5) are positive (0.5900 and 0.2409, respectively).

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant negative impact on SR with the coefficient of -0.4984.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly positive (0.7857) before the crisis. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and negatively related to SR

**Table 38: Summary of Significant Effects of Diversifications for Regional BHCs  
for Total Period**

		<u>Accounting Returns</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2		+		+
Loan Div. (LD)	H3		+		
Security Div. (SD)	H4		-		-
Non-interest-income Div. (NIID)	H5				
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3		-		
Security Div. (SD)	H4*S4		+		+
Non-interest-income Div. (NIID)	H5*S5				
Off-balance-sheet Div. (OBSD)	H6*S6	+		+	
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5				-
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity  
RAROE: risk-adjusted return on equity

**Table 39: Summary of Significant Effects of Diversifications for Regional BHCs**

**for Sub-periods**

Accounting Returns									
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
Variable		ROA	RAROA	ROE	RAROE	ROA	RAROA	ROE	RAROE
Abbreviation									
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2		+		+				
Loan Div. (LD)	H3		+		+				
Security Div. (SD)	H4		-		-				
Non-interest-income Div. (NIID)	H5			+					+
Off-balance-sheet Div. (OBSD)	H6								
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2								
Loan Div. (LD)	H3*S3		-		-				
Security Div. (SD)	H4*S4		+		+				
Non-interest-income Div. (NIID)	H5*S5	+							
Off-balance-sheet Div. (OBSD)	H6*S6	+		+			-		-
<b>Activity interaction</b>									
DGD * LD	H2*H3	+		+					
DGD * NIID	H2*H5				-				
SD * OBSD	H4*H6								
All Activities	H2*H3*H4*H5*H6								

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity

RAROE: risk-adjusted return on equity



with the coefficient of -0.9679. Therefore, greater domestic geographic diversification could still reduce SR with negative net impact of  $0.7857 - 0.9679 * S2$  if  $S2$  is greater than 0.8118. The results show that the sign of the impact of domestic geographic diversification depends on the scale of domestic geographic ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative. During the crisis, although the coefficient on domestic geographic diversification are insignificant, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and negatively related to SR with the coefficient of -2.7269. Therefore, domestic geographic diversification still reduces SR during the crisis.

Although both the coefficients on security diversification ( $H4$ ) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and negatively related to SR with the coefficient of -12.7389 during the crisis. Therefore, security diversification still reduces SR during the crisis.

The coefficient on non-interest-income diversification ( $H5$ ) is significantly positive (0.3059) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and negatively related to SR with the coefficient of -20.8306 before the crisis. Therefore, greater non-interest-income diversification could still reduce SR with negative net impact of  $0.3059 - 20.8306 * S5$  if  $S5$  is greater than 0.0147. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The interaction impact of domestic geographic and loan diversifications ( $H2*H3$ ) is insignificant before the crisis while it becomes positively significant (5.2748) during the crisis.

(b) **Risk-adjusted stock return (RASR)** –Appendix 30 reports the statistical results.

#### Total period:

Only non-interest-income diversification (H5) has significant impact on RASR. The impact is positive with the coefficient of 1.4488. However the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to EASR with the coefficient of -109.6352. Therefore, greater non-interest-income diversification could still reduce RASR with negative net impact of  $1.4488 - 109.6352 * S5$  if S5 is greater than 0.0133. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio. If the ratio is large enough, the impact turns from positive to negative.

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant negative impact on RASR with the coefficient of -3.4354.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly positive (5.3683) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and negatively related to RASR with the coefficient of -3.9497 before the crisis. Even if S2 were 1, the net impact of  $5.3683 - 3.9497 * S2$  would still be positive. Therefore, the impact of domestic geographic diversification is positive.

The coefficient on non-interest-income diversification (H5) is significantly positive (1.5178) before the crisis, while it becomes insignificant during the crisis. Moreover, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to RASR with the coefficient of -116.8884 before the crisis. Therefore, greater non-interest-income diversification could still reduce RASR with negative net impact of  $1.5178 - 116.8884 * S5$  if S5 is greater than 0.0130. The results show that the sign of the impact of non-interest-income diversification depends on

the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The interaction impact of domestic geographic and loan diversifications (H2\*H3) is insignificant before the crisis while it becomes positively significant (40.4919) during the crisis.

**Summary for market returns** - Table 40 reports the summary of significant effects of diversifications and interactions for total period. Table 41 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 3.3 Credit risk

**Net charge-offs (NCO)** –Appendix 31 reports the statistical results.

#### Total period:

Three types of diversification have significant impacts on ROA. They are security diversification, non-interest-income diversification and off-balance-sheet diversification. The coefficient on security diversification (H4) is -0.0033. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to NCO with the coefficient of 0.0108. Therefore, greater security diversification could still increase NCO with positive net impact of  $-0.0033 + 0.0108 * S4$  if S4 is greater than 0.3056. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

Although individual non-interest-income diversification (H5) has no significant impact on NCO, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to NCO with the coefficient of 0.2033. Therefore, non-interest-income diversification still increases NCO.

Similarly, although individual off-balance-sheet diversification (H6) has no

**Table 40: Summary of Significant Effects of Diversifications for Regional  
BHCs for Total Period**

		<u>Market Returns</u>	
	Variable Abbreviation	SR	RASR
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2	+	
Loan Div. (LD)	H3		
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5	+	+
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		-
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5	-	-
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

SR: stock return      RASR: risk-adjusted stock return

**Table 41: Summary of Significant Effects of Diversifications for Regional BHCs**  
for Sub-periods

		Market Returns			
		<u>Before The Crisis</u>		<u>During The Crisis</u>	
	Variable Abbreviation	SR	RASR	SR	RASR
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2	+	+		
Loan Div. (LD)	H3				
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5	+	+		
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2	-	-	-	
Loan Div. (LD)	H3*S3				
Security Div. (SD)	H4*S4			-	
Non-interest-income Div. (NIID)	H5*S5	-	-		
Off-balance-sheet Div. (OBSD)	H6*S6	+	+	+	+
<b>Activity interaction</b>					
DGD * LD	H2*H3			+	+
DGD * NIID	H2*H5		-		-
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				

SR: stock return      RASR: risk-adjusted stock return

significant impact on NCO, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to NCO with the coefficient of -0.0021. Therefore, off-balance-sheet diversification still reduces NCO.

Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) is significantly positive (0.0034) before the crisis while it becomes significantly negative (-0.0950) during the crisis. The interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to NCO with the coefficient of -0.0033 before the crisis. Even if  $S3$  were 1, the net impact of  $0.0034 - 0.0033 * S3$  would still be positive. Therefore, the impact of loan diversification is positive before the crisis. Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and positively related to NCO with the coefficient of 0.1372 during the crisis. Therefore, greater loan diversification could still increase NCO with positive net impact of  $-0.0950 + 0.1372 * S3$  if  $S3$  is greater than 0.6925. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients on security diversification ( $H4$ ) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to NCO with the coefficient of 0.0037 before the crisis. Therefore, security diversification still increases NCO before the crisis.

The coefficient on non-interest-income diversification ( $H5$ ) is significantly negative (-0.0010) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of on-interest-income diversification and on-interest-income ratio ( $H5*S5$ ) is significantly and positively related to NCO with the coefficient of 0.1569 before the crisis. Therefore, greater on-interest-income diversification could still increase NCO with

positive net impact of  $-0.0010 + 0.1569 * S5$  if  $S5$  is greater than 0.0064. The results show that the sign of the impact of on-interest-income diversification depends on the scale of on-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive.

Both the coefficients on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) and on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) are significantly negative (-0.0038 and -0.0133, respectively) before the crisis while they become insignificant during the crisis.

**Summary for credit risk** - Table 42 reports the summary of significant effects of diversifications and interactions for total period. Table 43 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 3.4 Market risk

(a) **Maturity gap (MG)** –Appendix 32 reports the statistical results.

#### Total period:

Three types of diversification have significant impacts on MG. They are domestic geographic diversification, loan diversification and security diversification. The coefficient on domestic geographic diversification ( $H2$ ) is 0.9364.

The coefficient on loan diversification ( $H3$ ) is 0.9617. However the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to MG with the coefficient of -1.1174. Therefore, greater loan diversification could still reduce MG with negative net impact of  $0.9617 - 1.1174 * S3$  if  $S3$  is greater than 0.8607. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio. If the ratio is large enough, the impact turns from positive to negative.

Although individual security diversification ( $H4$ ) has no significant impact on MG, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and

**Table 42: Summary of Significant Effects of Diversifications for Regional BHCs  
for Total Period**

		<u>Credit Risk</u>
	Variable Abbreviation	NCO
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	-
Non-interest-income Div. (NIID)	H5	
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	+
Non-interest-income Div. (NIID)	H5*S5	+
Off-balance-sheet Div. (OBSD)	H6*S6	-
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H2*H3*H4*H5*H6	

NCO: net charge-offs



**Table 43: Summary of Significant Effects of Diversifications for Regional BHCs  
for Sub-periods**

		Credit Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	NCO	NCO
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3	+	-
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5	-	
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3	-	+
Security Div. (SD)	H4*S4	+	
Non-interest-income Div. (NIID)	H5*S5	+	
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3	-	
DGD * NIID	H2*H5		
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6	-	

NCO: net charge-offs

negatively related to MG with the coefficient of -1.3805. Therefore, security diversification still reduces MG.

The interaction of domestic geographic and loan diversifications ( $H2*H3$ ) and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) have significant negative impact on MG with the coefficient of -1.3623 and -0.6106, respectively. In addition, the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) has significant positive impact on MG with the coefficient of 1.1377.

#### Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) is significantly positive (1.2797) before the crisis, while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to MG with the coefficient of -1.6577 before the crisis. Therefore, greater loan diversification could still reduce MG with negative net impact of  $1.2797 - 1.6577 * S3$  if  $S3$  is greater than 0.7720. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

Although both the coefficients on non-interest-income diversification ( $H5$ ) are insignificant before and during the crisis, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and positively related to MG with the coefficient of 18.2519 before the crisis. Therefore, non-interest-income diversification still increases MG before the crisis.

The interaction impact of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is negatively significant (-0.5556) before the crisis while it becomes insignificant during the crisis.

(b) **Derivatives loss (DL)** –Appendix 33 reports the statistical results.

Total period:

Only domestic geographic diversification (H2) has significant impact on DL. The impact is positive with the coefficient of 0.00011. Moreover, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and negatively related to DL with the coefficient of -0.000102. Even if S2 were 1, the net impact of  $0.00011 - 0.000102 * S2$  would still be positive. Therefore, the impact of domestic geographic diversification is positive.

Sub-period analysis:

Although both the coefficients on off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and positively related to DL with the coefficient of 0.000015 before the crisis. Therefore, off-balance-sheet diversification still increases DL before the crisis.

(c) **Market beta (MB)** –Appendix 34 reports the statistical results.

Total period:

Two types of diversification have significant impacts on ROA. They are loan diversification and security diversification. The coefficient on loan diversification (H3) is -1.4669. However, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and positively related to MB with the coefficient of 1.9253. Therefore, greater loan diversification could still increase MB with positive net impact of  $-1.4669 + 1.9253 * S3$  if S3 is greater than 0.7620. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio. If the ratio is large enough, the impact turns from negative to positive.

Although individual security diversification (H4) has no significant impact on MB,

the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and negatively related to MB with the coefficient of -2.2782. Therefore, security diversification still reduces MB.

The interaction of domestic geographic and loan diversifications ( $H2*H3$ ) has significant positive impact on MB with the coefficient of 1.4508. In addition, the interaction of domestic geographic diversifications ( $H2*H5$ ) has significant negative impact on MB with the coefficient of -0.5980.

#### Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) is insignificant before the crisis while it becomes negatively significant (-5.8761) during the crisis. Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and positively related to MB with the coefficient of 10.7722 during the crisis. Therefore, greater loan diversification could still increase MB with positive net impact of  $-5.8761 + 10.7722 * S3$  if  $S3$  is greater than 0.5455. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients on security diversification ( $H4$ ) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and negatively related to MB with the coefficient of -0.9215 before the crisis. Therefore, security diversification still reduces MB before the crisis.

The coefficient on non-interest-income diversification ( $H5$ ) is significantly positive (0.1252) before the crisis while it becomes insignificant during the crisis.

Although both the coefficients on off-balance-sheet diversification ( $H6$ ) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to MB with the coefficient of -1.6649 during the crisis. Therefore, off-balance-sheet

diversification still reduces MB during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is significantly positive (0.7830) before the crisis while it becomes insignificant during the crisis. In addition, the coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is significantly negative (-1.4149) before the crisis while it becomes significantly positive (14.3740) during the crisis.

(d) **Interest rate beta (IRB)** –Appendix 35 reports the statistical results.

Total period:

Only domestic geographic diversification (2) has significant impact on IRB. The impact is negative with the coefficient of -0.9318.

The interaction of domestic geographic and loan diversifications ( $H2*H3$ ) has significant positive impact on IRB with the coefficient of 0.7850.

Sub-period analysis:

The coefficient on loan diversification ( $H3$ ) is significantly negative (-1.1391) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and positively related to IRB with the coefficient of 1.2808 before the crisis. Therefore, greater loan diversification could still increase IRB with positive net impact of  $-1.1391 + 1.2808 * S3$  if  $S3$  is greater than 0.8894. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients on off-balance-sheet diversification ( $H6$ ) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to IRB with the coefficient of -0.8426 during the crisis. Therefore, off-balance-sheet

diversification still reduces IRB during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is significantly positive (1.0751) before the crisis while it becomes insignificant during the crisis. In addition, the coefficient on the interaction of domestic geographic and security diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes positively significant (2.3430) during the crisis.

**Summary for market risk** - Table 44 reports the summary of significant effects of diversifications and interactions for total period. Table 45 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 3.5 Default risk

**Distance to default (Z-score)** –Appendix 36 reports the statistical results.

#### Total period:

Four types of diversification have significant impacts on Z. They are domestic geographic diversification, loan diversification, security diversification and non-interest-income diversification. The coefficient on domestic geographic diversification ( $H2$ ) is 576.24. However the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and negatively related to Z with the coefficient of -458.89. Even if  $S2$  were 1, the net impact of  $576.24 - 458.89 * S2$  would still be positive. Therefore, the impact of domestic geographic diversification is positive.

The coefficient on loan diversification ( $H3$ ) is 817.23. However the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to Z with the coefficient of -1091.70. Therefore, greater loan diversification could still reduce Z with negative net impact of  $817.23 - 1091.70 * S3$  if  $S3$  is greater than 0.7486. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio.

**Table 44: Summary of Significant Effects of Diversifications for Regional BHCs**  
**for Total Period**

		<u>Market Risk</u>			
	Variable Abbreviation	MG	DL	MB	IRB
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2	+	+		-
Loan Div. (LD)	H3	+		-	
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5				
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2		-		
Loan Div. (LD)	H3*S3	-		+	
Security Div. (SD)	H4*S4	-		-	
Non-interest-income Div. (NIID)	H5*S5				
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
DGD * LD	H2*H3	-		+	+
DGD * NIID	H2*H5	-		-	
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6	+			

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

**Table 45: Summary of Significant Effects of Diversifications for Regional BHCs**

**for Sub-periods**

		Market Risk							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable Abbreviation	MG	DL	MB	IRB	MG	DL	MB	IRB
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2	+			-	+			-
Loan Div. (LD)	H3	+			-			-	
Security Div. (SD)	H4								
Non-interest-income Div. (NIID)	H5			+					
Off-balance-sheet Div. (OBSD)	H6								
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2								
Loan Div. (LD)	H3*S3	-			+			+	
Security Div. (SD)	H4*S4			-					
Non-interest-income Div. (NIID)	H5*S5	+							
Off-balance-sheet Div. (OBSD)	H6*S6		+					-	-
<b>Activity interaction</b>									
DGD * LD	H2*H3	-		+	+	-			
DGD * NIID	H2*H5	-						-	+
SD * OBSD	H4*H6								
All Activities	H2*H3*H4*H5*H6			-				+	

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta



If the ratio is large enough, the impact turns from positive to negative. The coefficient on security diversification (H4) is -456.09. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to Z with the coefficient of 3157.85. Therefore, greater security diversification could still increase Z with positive net impact of  $-456.09 + 3157.85 * S4$  if S4 is greater than 0.1445. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

Although individual non-interest-income diversification (H5) has no significant impact on Z, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to Z with the coefficient of -13723.74. Therefore, non-interest-income diversification still reduces Z.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly positive (1217.58) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and negatively related to Z with the coefficient of -975.76 before the crisis. Even if S2 were 1, the net impact of  $1217.58 - 975.76 * S2$  would still be positive. Therefore, the impact of domestic geographic diversification is positive before the crisis.

The coefficient on loan diversification (H3) is significantly positive (1534.27) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to Z with the coefficient of -1869.44 before the crisis. Therefore, greater loan diversification could still reduce Z with negative net impact of  $1534.27 - 1869.44 * S3$  if S3 is greater than 0.8208. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on security diversification (H4) is significantly negative (-468.46) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to Z with the coefficient of 3788.70 before the crisis. Therefore, greater security diversification could still increase Z with positive net impact of  $-468.46 + 3788.70 * S4$  if S4 is greater than 0.1237. The results show that the sign of the impact of security diversification depends on the scale of security ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients on off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to Z with the coefficient of -476.12 during the crisis. Therefore, off-balance-sheet diversification still reduces Z during the crisis.

**Summary for default risk** - Table 46 reports the summary of significant effects of diversifications and interactions for total period. Table 47 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## **SUMMARY OF DIVERSIFICATION AND INTERACTION EFFECTS FOR REGIONAL BHCs**

a. Total period: Table 48 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Domestic geographic diversification (H2), loan diversification (H3), the interaction of security diversification and security ratio (H4\*S4), and the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification (H4), the

**Table 46: Summary of Significant Effects of Diversifications for Regional  
BHCs for Total Period**

		<u>Default Risk</u>
	Variable Abbreviation	Z
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	+
Loan Div. (LD)	H3	+
Security Div. (SD)	H4	-
Non-interest-income Div. (NIID)	H5	
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	-
Loan Div. (LD)	H3*S3	-
Security Div. (SD)	H4*S4	+
Non-interest-income Div. (NIID)	H5*S5	-
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H2*H3*H4*H5*H6	

Z: distance to default

**Table 47: Summary of Significant Effects of Diversifications for Regional BHCs**  
for Sub-periods

		Default Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	Z	Z
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2	+	
Loan Div. (LD)	H3	+	
Security Div. (SD)	H4	-	
Non-interest-income Div. (NIID)	H5		
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2	-	
Loan Div. (LD)	H3*S3	-	
Security Div. (SD)	H4*S4	+	
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		-
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5		
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

Z: distance to default

interaction of loan diversification and loan ratio ( $H3*S3$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Domestic geographic diversification ( $H2$ ) and non-interest-income diversification ( $H5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Security diversification ( $H4$ ) and the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of security diversification and security ratio ( $H4*S4$ ) and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - The interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification ( $H2$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Domestic geographic diversification ( $H2$ ), loan diversification

**Table 48: Number and Percentage of Significant Effects of Diversifications and Interactions for Regional BHCs for Total Period**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	2	0	2	1	0	1	0	0	0	1	2	3	1	0	1	5	2	7
Loan Div. (LD)	H3	1	0	1	0	0	0	0	0	0	1	1	2	1	0	1	3	1	4
Security Div. (SD)	H4	0	2	2	0	0	0	1	0	1	0	0	0	0	1	1	1	3	4
Non-interest-income Div. (NIID)	H5	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	2	0	2
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	1	2
Loan Div. (LD)	H3*S3	0	1	1	0	0	0	0	0	0	1	1	2	0	1	1	1	3	4
Security Div. (SD)	H4*S4	2	0	2	0	0	0	0	1	1	2	0	2	1	0	1	5	1	6
Non-interest-income Div. (NIID)	H5*S5	0	0	0	0	1	1	0	1	1	0	0	0	0	1	1	0	3	3
Off-balance-sheet Div. (OBSD)	H6*S6	2	0	2	0	0	0	1	0	1	0	0	0	0	0	0	3	0	3
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	1	2	3
DGD * NIID	H2*H5	0	1	1	0	2	2	0	0	0	2	0	2	0	0	0	2	3	5
SD * OBSD	H4*H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	50	0	50	x	50	0	50	x	0	0	0	.	25	50	75	0.50	100	0	100	x	42	17	58	2.47
Loan Div. (LD)	H3	25	0	25	x	0	0	0	.	0	0	0	.	25	25	50	1.00	100	0	100	x	25	8	33	3.13
Security Div. (SD)	H4	0	50	50	0.00	0	0	0	.	100	0	100	x	0	0	0	.	0	100	100	0.00	8	25	33	0.32
Non-interest-income Div. (NIID)	H5	0	0	0	.	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	100	100	0.00	8	8	17	1.00
Loan Div. (LD)	H3*S3	0	25	25	0.00	0	0	0	.	0	0	0	.	25	25	50	1.00	0	100	100	0.00	8	25	33	0.32
Security Div. (SD)	H4*S4	50	0	50	X	0	0	0	.	0	100	100	0.00	50	0	50	X	100	0	100	X	42	8	50	5.25
Non-interest-income Div. (NIID)	H5*S5	0	0	0	.	0	50	50	0.00	0	100	100	0.00	0	0	0	.	0	100	100	0.00	0	25	25	0.00
Off-balance-sheet Div. (OBSD)	H6*S6	50	0	50	X	0	0	0	.	100	0	100	x	0	0	0	.	0	0	0	.	25	0	25	X
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	0	0	.	0	0	0	.	0	0	0	.	25	50	75	0.50	0	0	0	.	8	17	25	0.47
DGD * NIID	H2*H5	0	25	25	0.00	0	100	100	0.00	0	0	0	.	50	0	50	X	0	0	0	.	17	25	42	0.68
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	8	8	0.00

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

(H3), and the interaction of security diversification and security ratio (H4\*S4) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification (H4), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

b. Before the crisis: Table 49 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Domestic geographic diversification (H2), loan diversification (H3), non-interest-income diversification (H5), the interaction of security diversification and security ratio (H4\*S4), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), and the interaction of domestic geographic and loan diversifications (H2\*H3) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification (H4), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Domestic geographic diversification (H2), non-interest-income diversification (H5), and the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), and the

**Table 49: Number and Percentage of Significant Effects of Diversifications and Interactions for Regional BHCs Before The Crisis**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)			
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances			
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	
<b>Activity diversification</b>																				
Domestic Geographic Div. (DGD)	H2	2	0	2	2	0	0	2	0	0	0	1	1	2	1	0	1	6	1	7
Loan Div. (LD)	H3	2	0	2	0	0	0	0	1	1	1	1	1	2	1	0	1	4	2	6
Security Div. (SD)	H4	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	3
Non-interest-income Div. (NIID)	H5	1	0	1	2	0	2	2	1	0	1	0	1	1	0	0	0	4	1	5
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Scale interaction</b>																				
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	2	2	2	0	0	0	0	0	0	0	1	1	0	3	3
Loan Div. (LD)	H3*S3	0	2	2	0	0	0	0	1	0	1	1	1	2	0	1	1	2	4	6
Security Div. (SD)	H4*S4	2	0	2	0	0	0	0	0	1	1	1	0	1	1	0	1	4	1	5
Non-interest-income Div. (NIID)	H5*S5	1	0	1	0	2	2	2	0	1	1	0	1	1	0	0	0	1	4	5
Off-balance-sheet Div. (OBSD)	H6*S6	2	0	2	2	0	2	2	0	0	0	0	1	1	0	0	0	4	1	5
<b>Activity interaction</b>																				
DGD * LD	H2*H3	2	0	2	0	0	0	0	1	0	1	1	2	3	0	0	0	4	2	6
DGD * NIID	H2*H5	0	1	1	0	1	1	1	0	0	0	1	0	1	0	0	0	1	2	3
SD * OBSD	H4*H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	2	0	2

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	50	0	50	x	100	0	100	x	0	0	0	.	25	25	50	1.00	100	0	100	x	50	8	58	6.25
Loan Div. (LD)	H3	50	0	50	x	0	0	0	.	0	100	100	0.00	25	25	50	1.00	100	0	100	x	33	17	50	1.94
Security Div. (SD)	H4	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	100	100	0.00	0	25	25	0.00
Non-interest-income Div. (NIID)	H5	25	0	25	X	100	0	100	x	100	0	100	X	0	25	25	0.00	0	0	0	.	33	8	42	4.13
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	100	100	0.00	0	0	0	.	0	0	0	.	0	100	100	0.00	0	25	25	0.00
Loan Div. (LD)	H3*S3	0	50	50	0.00	0	0	0	.	100	0	100	X	25	25	50	1.00	0	100	100	0.00	17	33	50	0.52
Security Div. (SD)	H4*S4	50	0	50	X	0	0	0	.	0	100	100	0.00	25	0	25	X	100	0	100	x	33	8	42	4.13
Non-interest-income Div. (NIID)	H5*S5	25	0	25	X	0	100	100	0.00	0	100	100	0.00	0	25	25	0.00	0	0	0	.	8	33	42	0.24
Off-balance-sheet Div. (OBSD)	H6*S6	50	0	50	X	100	0	100	X	0	0	0	.	0	25	25	0.00	0	0	0	.	33	8	42	4.13
<b>Activity interaction</b>																									
DGD * LD	H2*H3	50	0	50	X	0	0	0	.	100	0	100	x	25	50	75	0.50	0	0	0	.	33	17	50	1.94
DGD * NIID	H2*H5	0	25	25	0.00	0	50	50	0.00	0	0	0	.	25	0	25	x	0	0	0	.	8	17	25	0.47
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	100	0	100	x	25	0	25	x	0	0	0	.	17	0	17	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".



interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Non-interest-income diversification ( $H5$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, loan diversification ( $H3$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - The interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, non-interest-income diversification ( $H5$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), and the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Domestic geographic diversification ( $H2$ ), loan diversification ( $H3$ ), and the interaction of security diversification and security ratio ( $H4*S4$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ), security diversification ( $H4$ ),

and the interaction of loan diversification and loan ratio (H3\*S3) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

c. During the crisis: Table 50 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Non-interest-income diversification (H5) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - The interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) and the interaction of domestic geographic and loan diversifications (H2\*H3) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of security diversification and security ratio (H4\*S4), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Loan diversification (H3) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Loan diversification (H3), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), and the interaction of domestic geographic and loan diversifications (H2\*H3) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3) and the interaction of

**Table 50: Number and Percentage of Significant Effects of Diversifications and Interactions for Regional BHCs During The Crisis**

(Number)	Variable Abbreviation	(n=4) Accounting Returns			(n=2) Market Returns			(n=1) Credit Risk			(n=4) Market Risk			(n=1) Default Risk			(n=12) All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
Activity diversification																			
Domestic Geographic Div. (DGD)	H2	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2
Loan Div. (LD)	H3	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	2	0	2
Security Div. (SD)	H4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-interest-income Div. (NIID)	H5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scale interaction																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Loan Div. (LD)	H3*S3	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	2	2
Security Div. (SD)	H4*S4	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Non-interest-income Div. (NIID)	H5*S5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Off-balance-sheet Div. (OBSD)	H6*S6	0	2	2	2	0	2	0	0	0	2	0	2	0	1	1	4	3	7
Activity interaction																			
DGD * LD	H2*H3	0	0	0	2	0	2	0	0	0	1	0	1	0	0	0	3	0	3
DGD * NIID	H2*H5	0	0	0	0	1	1	0	0	0	1	1	2	0	0	0	1	2	3
SD * OBSD	H4*H6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1

( % )	Variable Abbreviation	Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
		+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
Domestic Geographic Div. (DGD)	H2	0	0	0	.	0	0	0	.	0	0	0	.	25	25	50	1.00	0	0	0	.	8	8	17	1.00
Loan Div. (LD)	H3	0	0	0	.	0	0	0	.	100	0	100	x	25	0	25	X	0	0	0	.	17	0	17	X
Security Div. (SD)	H4	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Non-interest-income Div. (NIID)	H5	25	0	25	x	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	8	0	8	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Scale interaction																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
Loan Div. (LD)	H3*S3	0	0	0	.	0	0	0	.	0	100	100	0.00	0	25	25	0.00	0	0	0	.	0	17	17	0.00
Security Div. (SD)	H4*S4	0	0	0	.	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
Non-interest-income Div. (NIID)	H5*S5	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Off-balance-sheet Div. (OBSD)	H6*S6	0	50	50	0.00	100	0	100	X	0	0	0	.	50	0	50	X	0	100	100	0.00	33	25	58	1.32
Activity interaction																									
DGD * LD	H2*H3	0	0	0	.	100	0	100	X	0	0	0	.	25	0	25	X	0	0	0	.	25	0	25	X
DGD * NIID	H2*H5	0	0	0	.	0	50	50	0.00	0	0	0	.	25	25	50	1.00	0	0	0	.	8	17	25	0.47
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	8	8	0.00

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** – No diversifications or interactions advantage BHCs. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

## 4 MONEY CENTER BHCs

### 4.1 Accounting returns

(a) **Return on asset (ROA)** –Appendix 37 reports the statistical results.

#### Total period:

Only security diversification has significant impact on ROA. The impact is negative. Although individual security diversification ( $H4$ ) has no significant impact on ROA, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to ROA with the coefficient of 0.0287. Therefore, security diversification still reduces ROA.

#### Sub-period analysis:

Although both the coefficients on domestic geographic diversification ( $H2$ ) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to ROA with the coefficient of 0.0604 during the crisis. Therefore, domestic geographic diversification still increases ROA during the crisis.

Although both the coefficients on off-balance-sheet diversification ( $H6$ ) are

insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to ROA with the coefficient of 0.0010 during the crisis. Therefore, off-balance-sheet diversification still increases ROA during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes positively significant (0.0761) during the crisis.

(b) **Risk-adjusted return on asset (RAROA)** –Appendix 38 reports the statistical results.

Total period:

No diversifications or interactions have significant impacts on RAROA.

Sub-period analysis:

Although both the coefficients on security diversification ( $H4$ ) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to RAROA with the coefficient of 67.5535 before the crisis. Therefore, security diversification still increases RAROA before the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is significantly negative (-116.0786) before the crisis while it becomes insignificant during the crisis.

(c) **Return on equity (ROE)** –Appendix 39 reports the statistical results.

Total period:

Three types of diversification have significant impacts on ROE. The impacts of security diversification and non-interest-income diversification are positive while the impact of off-balance-sheet diversification is negative.

Although individual security diversification ( $H4$ ) has no significant impact on ROE,

the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to ROE with the coefficient of 0.4663. Therefore, off-balance-sheet diversification still increases ROE.

Although individual non-interest-income diversification ( $H5$ ) has no significant impact on ROE, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and positively related to ROE with the coefficient of 13.0321. Therefore, non-interest-income diversification still increases ROE.

Although individual off-balance-sheet diversification ( $H6$ ) has no significant impact on ROE, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to ROE with the coefficient of -0.0047. Therefore, off-balance-sheet diversification still reduces ROE.

#### Sub-period analysis:

The coefficient on domestic geographic diversification ( $H2$ ) is insignificant before the crisis while it becomes negatively significant (-2.0301) during the crisis. Moreover, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to ROE with the coefficient of 0.5878 during the crisis. Even if  $S2$  were 1, the net impact of  $-2.0301 + 0.5878 * S2$  would still be negative. Therefore, the impact of domestic geographic diversification is negative during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes positively significant (1.2153) during the crisis.

(d) **Risk-adjusted return on equity (RAROE)** –Appendix 40 reports the statistical results.

#### Total period:

Only domestic geographic diversification has significant impact on RAROE. The impact is positive. Although individual domestic geographic diversification (H2) has no significant impact on RAROE, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to ROA with the coefficient of 23.1115. Therefore, domestic geographic diversification still increases RAROE.

Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly positive (73.3471) before the crisis while it becomes insignificant during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is significantly negative (-127.3256) before the crisis while it becomes insignificant during the crisis.

**Summary for accounting returns** - Table 51 reports the summary of significant effects of diversifications and interactions for total period. Table 52 reports the summary of significant effects of diversifications and interactions for the sub-periods.

#### 4.2 Market returns

(a) **Stock return (SR)** –Appendix 41 reports the statistical results.

Total period:

Three types of diversification have significant impacts on SR. The impacts of domestic geographic diversification, non-interest-income diversification and off-balance-sheet diversification are positive. The coefficient on domestic geographic diversification (H2) is 0.8567. The coefficient on non-interest-income diversification (H5) is 0.4247. The coefficient on off-balance-sheet diversification (H6) is 0.3423.

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant negative impact on SR with the coefficient of -0.6034.

Sub-period analysis:

**Table 51: Summary of Significant Effects of Diversifications for Money Center BHCs  
for Total Period**

		<u>Accounting Returns</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3				
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5				
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				+
Loan Div. (LD)	H3*S3				
Security Div. (SD)	H4*S4	+		+	
Non-interest-income Div. (NIID)	H5*S5			+	
Off-balance-sheet Div. (OBSD)	H6*S6			-	
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5				
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity  
RAROE: risk-adjusted return on equity



**Table 52: Summary of Significant Effects of Diversifications for Money Center BHCs**

**for Sub-periods**

		Accounting Returns							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2				+			-	
Loan Div. (LD)	H3								
Security Div. (SD)	H4								
Non-interest-income Div. (NIID)	H5								
Off-balance-sheet Div. (OBSD)	H6								
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2					+		+	
Loan Div. (LD)	H3*S3								
Security Div. (SD)	H4*S4		+		+				+
Non-interest-income Div. (NIID)	H5*S5								
Off-balance-sheet Div. (OBSD)	H6*S6					+			
<b>Activity interaction</b>									
DGD * LD	H2*H3		-		-				
DGD * NIID	H2*H5					+		+	
SD * OBSD	H4*H6								
All Activities	H2*H3*H4*H5*H6								

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity

RAROE: risk-adjusted return on equity

The coefficient on domestic geographic diversification (H2) is significantly positive (1.0403) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and negatively related to SR with the coefficient of -0.4766 before the crisis. Even if S2 were 1, the net impact of  $1.0403 - 0.4766 * S2$  would still be positive. Therefore, the impact of domestic geographic diversification is positive before the crisis.

The coefficient on loan diversification (H3) is insignificant before the crisis while it becomes negatively significant (-3.1628) during the crisis. Moreover, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and positively related to SR with the coefficient of 5.8509 during the crisis. Therefore, greater loan diversification could still improve SR with positive net impact of  $-3.1628 + 5.8509 * S3$  if S3 is greater than 0.5406. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio. If the ratio is large enough, the impact turns from negative to positive during the crisis.

The coefficient on security diversification (H4) is insignificant before the crisis while it becomes positively significant (5.6179) during the crisis.

Both the coefficients on non-interest-income diversification (H5) before and during the crisis are significantly positive (0.4824 and 2.1498, respectively). Moreover, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to SR with the coefficient of -68.4760 before the crisis. Therefore, greater non-interest-income diversification could still reduce SR with negative net impact of  $0.4824 - 68.4760 * S5$  if S5 is greater than 0.0071. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on off-balance-sheet diversification (H6) is insignificant before the

crisis while it becomes positively significant (3.3744) during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly negative (-0.7594) before the crisis while it becomes insignificant during the crisis. In addition, the coefficient on the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) is insignificant before the crisis while it becomes negatively significant (-10.8434) during the crisis.

(b) **Risk-adjusted stock return (RASR)** –Appendix 42 reports the statistical results.

Total period:

Two types of diversification have significant impacts on RASR. The impacts of domestic geographic diversification and off-balance-sheet diversification are positive. The coefficient on domestic geographic diversification ( $H2$ ) is 6.2490. The coefficient on off-balance-sheet diversification ( $H6$ ) is 2.4766.

The interaction of domestic geographic and loan diversifications ( $H2*H3$ ) has significant negative impact on RASR with the coefficient of -7.0782.

Sub-period analysis:

Although both the coefficients on security diversification ( $H4$ ) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to RASR with the coefficient of 34.1975 during the crisis. Therefore, security diversification still improves RASR during the crisis.

The coefficient on non-interest-income diversification ( $H5$ ) is significantly positive (2.6929) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and negatively related to RASR with the coefficient of -402.3415 before the crisis. Therefore, greater non-interest-income diversification could still reduce RASR

with negative net impact of  $2.6929 - 402.3415 * S5$  if  $S5$  is greater than 0.0067. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on off-balance-sheet diversification (H6) is insignificant before the crisis while it becomes positively significant (22.2708) during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is insignificant before the crisis while it becomes negatively significant (-233.3023) during the crisis. The coefficient on the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) is significantly negative (-4.1821) before the crisis while it becomes insignificant during the crisis. In addition, the coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is insignificant before the crisis while it becomes negatively significant (-66.0235) during the crisis.

**Summary for market returns** - Table 53 reports the summary of significant effects of diversifications and interactions for total period. Table 54 reports the summary of significant effects of diversifications and interactions for the sub-periods.

#### 4.3 Credit risk

**Net charge-offs (NCO)** –Appendix 43 reports the statistical results.

##### Total period:

Two types of diversification have significant impacts on ROA. The impact of loan diversification is negative while the impact of non-interest-income diversification is positive. The coefficient on loan diversification (H3) is -0.0016. The coefficient on non-interest-income diversification (H5) is 0.0028.

##### Sub-period analysis:

**Table 53: Summary of Significant Effects of Diversifications**  
**for Money Center BHCs for Total Period**

		<u>Market Returns</u>	
	Variable Abbreviation	SR	RASR
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2	+	+
Loan Div. (LD)	H3		
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5	+	
Off-balance-sheet Div. (OBSD)	H6	+	+
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		-
DGD * NIID	H2*H5	-	
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

SR: stock return      RASR: risk-adjusted stock return

**Table 54: Summary of Significant Effects of Diversifications for Money Center BHCs**  
for Sub-periods

Variable Abbreviation		Market Returns			
		<u>Before The Crisis</u>		<u>During The Crisis</u>	
		SR	RASR	SR	RASR
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2	+	+		+
Loan Div. (LD)	H3			-	
Security Div. (SD)	H4			+	
Non-interest-income Div. (NIID)	H5	+	+	+	
Off-balance-sheet Div. (OBSD)	H6			+	+
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2	-			
Loan Div. (LD)	H3*S3			+	
Security Div. (SD)	H4*S4				+
Non-interest-income Div. (NIID)	H5*S5	-	-		
Off-balance-sheet Div. (OBSD)	H6*S6			+	+
<b>Activity interaction</b>					
DGD * LD	H2*H3				-
DGD * NIID	H2*H5	-	-		
SD * OBSD	H4*H6			-	-
All Activities	H2*H3*H4*H5*H6				

SR: stock return      RASR: risk-adjusted stock return

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes negatively significant (-0.0241) during the crisis. The coefficient on loan diversification (H3) is significantly negative (-0.0017) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and positively related to NCO with the coefficient of 0.0030 before the crisis. Therefore, greater loan diversification could still increase NCO with positive net impact of  $-0.0017 + 0.0030 * S3$  if S3 is greater than 0.5667. The results show that the sign of the impact of security diversification depends on the scale of security ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients on security diversification (H4) are insignificant before and during the crisis, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to NCO with the coefficient of 0.0077 before the crisis. Therefore, security diversification still increases NCO before the crisis.

The coefficient on non-interest-income diversification (H5) is significantly positive (0.0026) before the crisis while it becomes insignificant during the crisis.

The coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is significantly negative (-0.0045) before the crisis while it becomes insignificant during the crisis.

**Summary for credit risk** - Table 55 reports the summary of significant effects of diversifications and interactions for total period. Table 56 reports the summary of significant effects of diversifications and interactions for the sub-periods.

#### 4.4 Market risk

(a) **Maturity gap (MG)** –Appendix 44 reports the statistical results.

Total period:

**Table 55: Summary of Significant Effects of Diversifications**  
**for Money Center BHCs for Total Period**

		<u>Credit Risk</u>
	Variable Abbreviation	NCO
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	-
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	+
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H2*H3*H4*H5*H6	

NCO: net charge-offs



**Table 56: Summary of Significant Effects of Diversifications for Money Center BHCs**  
for Sub-periods

		Credit Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	NCO	NCO
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		-
Loan Div. (LD)	H3	-	
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5	+	
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3	+	
Security Div. (SD)	H4*S4	+	
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5		
SD * OBSD	H4*H6	-	
All Activities	H2*H3*H4*H5*H6		

NCO: net charge-offs

Four types of diversification have significant impacts on MG. The impacts of domestic geographic diversification and loan diversification are positive while the impacts of security diversification and off-balance-sheet diversification are negative. Although individual domestic geographic diversification (H2) has no significant impact on MG, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to MG with the coefficient of 0.3992. Therefore, domestic geographic diversification still increases MG.

Although individual loan diversification (H3) has no significant impact on MG, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and positively related to MG with the coefficient of 0.6492. Therefore, loan diversification still increases MG.

The coefficient on security diversification (H4) is -0.6013. The coefficient on off-balance-sheet diversification (H6) is -0.2735.

The interaction of security and off-balance-sheet diversifications (H4\*H6) has significant positive impact on MG with the coefficient of 0.7665.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes negatively significant (-2.5801) during the crisis. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to MG with the coefficient of 0.3610. Therefore, domestic geographic diversification still increases ROE. Moreover, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to MG with the coefficient of 1.8465 during the crisis. Even if S2 were 1, the net impact of  $-2.5801 + 0.1.8465 * S2$  would still be negative. Therefore, the impact of domestic geographic diversification is negative during the crisis.

The coefficient on loan diversification (H3) is significantly positive (0.3044) before the crisis while it becomes insignificant during the crisis.

The coefficient on security diversification (H4) is significantly negative (-0.6971) before the crisis while it becomes insignificant during the crisis. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and negatively related to MG with the coefficient of -1.6011 during the crisis. Therefore, security diversification still reduces MG during the crisis.

The coefficient on off-balance-sheet diversification (H6) is significantly negative (-0.3379) before the crisis while it becomes insignificant during the crisis. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to MG with the coefficient of -0.0198 during the crisis. Therefore, off-balance-sheet diversification still reduces MG during the crisis.

The coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is significantly positive (0.8667) before the crisis while it becomes insignificant during the crisis.

(b) **Derivatives loss (DL)** –Appendix 45 reports the statistical results.

Total period:

Only the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) has significant positive impact on DL with the coefficient of 0.0006.

Sub-period analysis:

Although both the coefficients on security diversification (H4) are insignificant before and during the crisis, the interaction of security diversification and security ratio (H4\*S4) is significantly and negatively related to DL with the coefficient of -0.0025 during the crisis. Therefore, security diversification still reduces DL during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income

diversifications ( $H2*H5$ ) is significantly negative (-0.0002) before the crisis while it becomes insignificant during the crisis. In addition, the coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is significantly positive (0.0007) before the crisis while it becomes insignificant during the crisis.

(c) **Market beta (MB)** –Appendix 46 reports the statistical results.

Total period:

No diversifications or interactions have significant impacts on MB.

Sub-period analysis:

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly negative (-0.3925) before the crisis while it becomes insignificant during the crisis.

(d) **Interest rate beta (IRB)** –Appendix 47 reports the statistical results.

Total period:

Two types of diversification have significant impacts on IRB. The impact of domestic geographic diversification is positive while the impact of non-interest-income diversification is negative. Although individual domestic geographic diversification ( $H2$ ) has no significant impact on IRB, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to IRB with the coefficient of 0.4176. Therefore, domestic geographic diversification still increases IRB. The coefficient on non-interest-income diversification ( $H5$ ) is -0.3695.

Sub-period analysis:

Although both the coefficients on domestic geographic diversification ( $H2$ ) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to IRB

with the coefficient of 3.4411 during the crisis. Therefore, domestic geographic diversification still increases IRB during the crisis.

The coefficient on security diversification (H4) is insignificant before the crisis while it becomes negatively significant (-6.0019) during the crisis.

The coefficient on non-interest-income diversification (H5) is significantly negative (-0.3629) before the crisis while it becomes insignificant during the crisis. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to IRB with the coefficient of 41.1594 before the crisis. Therefore, greater non-interest-income diversification could still increase IRB with positive net impact of  $-0.3629 + 41.1594 * S5$  if S5 is greater than 0.0089. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive. Moreover, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to IRB with the coefficient of 159.2641 during the crisis. Therefore, non-interest-income diversification still increases IRB during the crisis.

The coefficient on off-balance-sheet diversification (H6) is insignificant before the crisis while it becomes negatively significant (-3.7632) during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) is insignificant before the crisis while it becomes negatively significant (-4.6397) during the crisis. The coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is insignificant before the crisis while it becomes positively significant (10.0336) during the crisis.

(e) **Value at Risk (VaR)** –Appendix 48 reports the statistical results.

Total period:

Two types of diversification have significant impacts on VaR. Both the impacts of

security diversification and off-balance-sheet diversification are positive. The coefficient on security diversification (H4) is 0.0002. Although individual off-balance-sheet diversification (H6) has no significant impact on VaR, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and positively related to VaR with the coefficient of 0.000007. Therefore, off-balance-sheet diversification still increases VaR.

Sub-period analysis:

Although both the coefficients on domestic geographic diversification (H2) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and positively related to VaR with the coefficient of 0.0002 before the crisis. Therefore, domestic geographic diversification still increases VaR before the crisis.

Although both the coefficients on loan diversification (H3) are insignificant before and during the crisis, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to VaR with the coefficient of -0.0002 before the crisis. Therefore, loan diversification still reduces VaR before the crisis.

Although both the coefficients on security diversification (H4) are insignificant before and during the crisis, the interaction of security diversification and security ratio (H4\*S4) is significantly and negatively related to VaR with the coefficient of -0.0004 before the crisis. Therefore, security diversification still reduces VaR before the crisis.

The coefficient on off-balance-sheet diversification (H6) is significantly negative (-0.0001) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and positively related to VaR with the coefficient of 0.000007 before the crisis. Even if S6 were 1, the net impact of  $-0.0001 + 0.000007 * S6$  would still be

negative. Therefore, the impact of off-balance-sheet diversification is negative before the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes positively significant (0.0009) during the crisis. In addition, the coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is insignificant before the crisis while it becomes negatively significant (-0.0016) during the crisis.

**Summary for market risk** - Table 57 reports the summary of significant effects of diversifications and interactions for total period. Table 58 reports the summary of significant effects of diversifications and interactions for the sub-periods.

#### 4.5 Default risk

**Distance to default (Z-score)** –Appendix 49 reports the statistical results.

##### Total period:

Only domestic geographic diversification has significant impact on Z. The impact is positive. Although individual domestic geographic diversification ( $H2$ ) has no significant impact on Z, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to Z with the coefficient of 821.82. Therefore, domestic geographic diversification still increases Z.

##### Sub-period analysis:

Although both the coefficients on domestic geographic diversification ( $H2$ ) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to Z with the coefficient of 1036.01 before the crisis. Therefore, domestic geographic diversification still increases Z before the crisis.

**Table 57: Summary of Significant Effects of Diversifications for Money Center BHCs**  
**for Total Period**

		<u>Market Risk</u>				
	Variable Abbreviation	MG	DL	MB	IRB	VaR
<b>Activity diversification</b>						
Domestic Geographic Div. (DGD)	H2					
Loan Div. (LD)	H3					
Security Div. (SD)	H4	-				+
Non-interest-income Div. (NIID)	H5				-	
Off-balance-sheet Div. (OBSD)	H6	-				
<b>Scale interaction</b>						
Domestic Geographic Div. (DGD)	H2*S2	+			+	
Loan Div. (LD)	H3*S3	+				
Security Div. (SD)	H4*S4					
Non-interest-income Div. (NIID)	H5*S5					
Off-balance-sheet Div. (OBSD)	H6*S6	-				+
<b>Activity interaction</b>						
DGD * LD	H2*H3					
DGD * NIID	H2*H5					
SD * OBSD	H4*H6	+				
All Activities	H2*H3*H4*H5*H6		+			

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta  
VaR: value at risk



**Table 58: Summary of Significant Effects of Diversifications for Money Center BHCs**

**for Sub-periods**

		Market Risk									
		<u>Before The Crisis</u>					<u>During The Crisis</u>				
	Variable Abbreviation	MG	DL	MB	IRB	VaR	MG	DL	MB	IRB	VaR
<b>Activity diversification</b>											
Domestic Geographic Div. (DGD)	H2						-				
Loan Div. (LD)	H3	+									
Security Div. (SD)	H4	-								-	
Non-interest-income Div. (NIID)	H5				-						
Off-balance-sheet Div. (OBSD)	H6	-				-				-	
<b>Scale interaction</b>											
Domestic Geographic Div. (DGD)	H2*S2	+				+	+			+	
Loan Div. (LD)	H3*S3	+				-					
Security Div. (SD)	H4*S4					-	-	-			
Non-interest-income Div. (NIID)	H5*S5				+					+	
Off-balance-sheet Div. (OBSD)	H6*S6					+	-				
<b>Activity interaction</b>											
DGD * LD	H2*H3										
DGD * NIID	H2*H5		-	-						-	+
SD * OBSD	H4*H6	+								+	
All Activities	H2*H3*H4*H5*H6		+								-

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

VaR: value at risk

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly positive (769.86) before the crisis while it becomes insignificant during the crisis.

**Summary for default risk** - Table 59 reports the summary of significant effects of diversifications and interactions for total period. Table 60 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## **SUMMARY OF DIVERSIFICATION AND INTERACTION EFFECTS FOR MONEY CENTER BHCs**

a. Total period: Table 61 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - The interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Domestic geographic diversification ( $H2$ ), non-interest-income diversification ( $H5$ ), and off-balance-sheet diversification ( $H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**Table 59: Summary of Significant Effects of Diversifications  
for Money Center BHCs for Total Period**

		<u>Default Risk</u>
	Variable Abbreviation	Z
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	+
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H2*H3*H4*H5*H6	

Z: distance to default

**Table 60: Summary of Significant Effects of Diversifications  
for Money Center BHCs for Sub-periods**

		Default Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
Variable Abbreviation		Z	Z
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5		
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2	+	
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5	+	
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

Z: distance to default

**Table 61: Number and Percentage of Significant Effects of Diversifications and Interactions for Money Center BHCs for Total Period**

		(n=4)			(n=2)			(n=1)			(n=5)			(n=1)			(n=13)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	2	0	2
Loan Div. (LD)	H3	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1
Security Div. (SD)	H4	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2
Non-interest-income Div. (NIID)	H5	0	0	0	1	0	1	0	1	1	1	0	1	0	0	0	2	1	3
Off-balance-sheet Div. (OBSD)	H6	0	0	0	2	0	2	0	0	0	1	0	1	0	0	0	3	0	3
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	1	0	1	0	0	0	0	0	0	0	2	2	1	0	1	2	2	4
Loan Div. (LD)	H3*S3	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Security Div. (SD)	H4*S4	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Non-interest-income Div. (NIID)	H5*S5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Off-balance-sheet Div. (OBSD)	H6*S6	0	1	1	0	0	0	0	0	0	1	1	2	0	0	0	1	2	3
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
DGD * NIID	H2*H5	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
SD * OBSD	H4*H6	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	0	0	0	.	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	15	0	15	x
Loan Div. (LD)	H3	0	0	0	.	0	0	0	.	100	0	100	x	0	0	0	.	0	0	0	.	8	0	8	x
Security Div. (SD)	H4	0	0	0	.	0	0	0	.	0	0	0	.	20	20	40	1.00	0	0	0	.	8	8	15	1.00
Non-interest-income Div. (NIID)	H5	0	0	0	.	50	0	50	x	0	100	100	0.00	20	0	20	X	0	0	0	.	15	8	23	1.88
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	100	0	100	x	0	0	0	.	20	0	20	X	0	0	0	.	23	0	23	X
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	25	0	25	x	0	0	0	.	0	0	0	.	0	40	40	0.00	100	0	100	x	15	15	31	1.00
Loan Div. (LD)	H3*S3	0	0	0	.	0	0	0	.	0	0	0	.	0	20	20	0.00	0	0	0	.	0	8	8	0.00
Security Div. (SD)	H4*S4	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	15	0	15	X
Non-interest-income Div. (NIID)	H5*S5	25	0	25	x	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	8	0	8	X
Off-balance-sheet Div. (OBSD)	H6*S6	0	25	25	0.00	0	0	0	.	0	0	0	.	20	20	40	1.00	0	0	0	.	8	15	23	0.53
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	0	0	.	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
DGD * NIID	H2*H5	0	0	0	.	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	20	20	0.00	0	0	0	.	0	8	8	0.00
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	20	20	0.00	0	0	0	.	0	8	8	0.00

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

**For credit risk** - Loan diversification (H3) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, non-interest-income diversification (H5) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Non-interest-income diversification (H5) and off-balance-sheet diversification (H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of security and off-balance-sheet diversifications (H4\*H6), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - The interaction of domestic geographic diversification and deposit ratio (H2\*S2) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts.

b. Before the crisis: Table 62 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Domestic geographic diversification (H2) and the interaction of security diversification and security ratio (H4\*S4) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic and loan diversifications (H2\*H3) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Domestic geographic diversification (H2) and non-interest-income diversification (H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the

interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Loan diversification ( $H3$ ) and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, non-interest-income diversification ( $H5$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), and the interaction of security diversification and security ratio ( $H4*S4$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Security diversification ( $H4$ ), non-interest-income diversification ( $H5$ ), off-balance-sheet diversification ( $H6$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, loan diversification ( $H3$ ), the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - The interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) and the interaction of domestic geographic and non-interest-income

**Table 62: Number and Percentage of Significant Effects of Diversifications and Interactions for Money Center BHCs Before The Crisis**

		(n=4)			(n=2)			(n=1)			(n=5)			(n=1)			(n=13)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	1	0	1	2	0	2	0	0	0	0	0	0	0	0	0	3	0	3
Loan Div. (LD)	H3	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	1	1	2
Security Div. (SD)	H4	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
Non-interest-income Div. (NIID)	H5	0	0	0	2	0	2	0	1	1	1	0	1	0	0	0	3	1	4
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	2	0	2
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	1	1	0	0	0	0	2	2	1	0	1	1	3	4
Loan Div. (LD)	H3*S3	0	0	0	0	0	0	0	1	1	1	1	2	0	0	0	1	2	3
Security Div. (SD)	H4*S4	2	0	2	0	0	0	0	1	1	1	0	1	0	0	0	3	1	4
Non-interest-income Div. (NIID)	H5*S5	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	3	3
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
DGD * NIID	H2*H5	0	0	0	0	2	2	0	0	0	2	0	2	1	0	1	3	2	5
SD * OBSD	H4*H6	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	1	1	2
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	25	0	25	x	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	23	0	23	x
Loan Div. (LD)	H3	0	0	0	.	0	0	0	.	100	0	100	x	0	20	20	0.00	0	0	0	.	8	8	15	1.00
Security Div. (SD)	H4	0	0	0	.	0	0	0	.	0	0	0	.	20	0	20	X	0	0	0	.	8	0	8	X
Non-interest-income Div. (NIID)	H5	0	0	0	.	100	0	100	x	0	100	100	0.00	20	0	20	X	0	0	0	.	23	8	31	2.88
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	0	0	.	40	0	40	X	0	0	0	.	15	0	15	X
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	50	50	0.00	0	0	0	.	0	40	40	0.00	100	0	100	x	8	23	31	0.35
Loan Div. (LD)	H3*S3	0	0	0	.	0	0	0	.	0	100	100	0.00	20	20	40	1.00	0	0	0	.	8	15	23	0.53
Security Div. (SD)	H4*S4	50	0	50	x	0	0	0	.	0	100	100	0.00	20	0	20	X	0	0	0	.	23	8	31	2.88
Non-interest-income Div. (NIID)	H5*S5	0	0	0	.	0	100	100	0.00	0	0	0	.	0	20	20	0.00	0	0	0	.	0	23	23	0.00
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	0	0	.	0	20	20	0.00	0	0	0	.	0	8	8	0.00
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	15	15	0.00
DGD * NIID	H2*H5	0	0	0	.	0	100	100	0.00	0	0	0	.	40	0	40	X	100	0	100	x	23	15	38	1.53
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	100	0	100	x	0	20	20	0.00	0	0	0	.	8	8	15	1.00
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	0	20	20	0.00	0	0	0	.	0	8	8	0.00

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".



diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts.

c. During the crisis: Table 63 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - The interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of security diversification and security ratio (H4\*S4), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Domestic geographic diversification (H2), security diversification (H4), non-interest-income diversification (H5), off-balance-sheet diversification (H6), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of security diversification and security ratio (H4\*S4), and the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, loan diversification (H3), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of security and off-balance-sheet diversifications (H4\*H6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Domestic geographic diversification (H2) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts.

**For market risk** - Domestic geographic diversification (H2), security diversification

**Table 63: Number and Percentage of Significant Effects of Diversifications and Interactions for Money Center BHCs During The Crisis**

		(n=4)			(n=2)			(n=1)			(n=5)			(n=1)			(n=13)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	0	1	1	1	0	1	1	0	1	1	0	1	0	0	0	3	1	4
Loan Div. (LD)	H3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Security Div. (SD)	H4	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	2	0	2
Non-interest-income Div. (NIID)	H5	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1
Off-balance-sheet Div. (OBSD)	H6	0	0	0	2	0	2	0	0	0	1	0	1	0	0	0	3	0	3
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	2	0	2	0	0	0	0	0	0	0	2	2	0	0	0	2	2	4
Loan Div. (LD)	H3*S3	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1
Security Div. (SD)	H4*S4	1	0	1	1	0	1	0	0	0	2	0	2	0	0	0	4	0	4
Non-interest-income Div. (NIID)	H5*S5	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Off-balance-sheet Div. (OBSD)	H6*S6	1	0	1	2	0	2	0	0	0	0	0	0	0	0	0	3	0	3
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
DGD * NIID	H2*H5	2	0	2	0	0	0	0	0	0	1	1	2	0	0	0	3	1	4
SD * OBSD	H4*H6	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	3	3
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	0	25	25	0.00	50	0	50	x	100	0	100	x	20	0	20	x	0	0	0	.	23	8	31	2.88
Loan Div. (LD)	H3	0	0	0	.	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
Security Div. (SD)	H4	0	0	0	.	50	0	50	x	0	0	0	.	20	0	20	x	0	0	0	.	15	0	15	X
Non-interest-income Div. (NIID)	H5	0	0	0	.	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	8	0	8	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	100	0	100	x	0	0	0	.	20	0	20	x	0	0	0	.	23	0	23	X
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	50	0	50	x	0	0	0	.	0	0	0	.	0	40	40	0.00	0	0	0	.	15	15	31	1.00
Loan Div. (LD)	H3*S3	0	0	0	.	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	8	0	8	X
Security Div. (SD)	H4*S4	25	0	25	x	50	0	50	x	0	0	0	.	40	0	40	X	0	0	0	.	31	0	31	X
Non-interest-income Div. (NIID)	H5*S5	0	0	0	.	0	0	0	.	0	0	0	.	0	20	20	0.00	0	0	0	.	0	8	8	0.00
Off-balance-sheet Div. (OBSD)	H6*S6	25	0	25	x	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	23	0	23	X
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	0	0	.	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
DGD * NIID	H2*H5	50	0	50	x	0	0	0	.	0	0	0	.	20	20	40	1.00	0	0	0	.	23	8	31	2.88
SD * OBSD	H4*H6	0	0	0	.	0	100	100	0.00	0	0	0	.	0	20	20	0.00	0	0	0	.	0	23	23	0.00
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	20	0	20	x	0	0	0	.	8	0	8	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

(H4), off-balance-sheet diversification (H6), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating (H4), off-balance-sheet diversification (H6), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** – No diversifications or interactions advantage BHCs.

## 5 INTERNATIONAL BHCs

### 5.1 Accounting returns

(a) **Return on asset (ROA)** –Appendix 50 reports the statistical results.

Total period:

Five types of diversification have significant impacts on ROA. The impacts of international diversification, domestic geographic diversification and loan diversification are negative while the impacts of security diversification and non-interest-income diversification are positive.

The coefficient on international geographic diversification (H1) is -0.0162. Although individual domestic geographic diversification (H2) has no significant impact on ROA,

the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and negatively related to ROA with the coefficient of -0.0105. Therefore, domestic geographic diversification still reduces ROA. The coefficient on loan diversification ( $H3$ ) is -0.0292.

Although individual security diversification ( $H4$ ) has no significant impact on ROA, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to ROA with the coefficient of 0.0326. Therefore, security diversification still increases ROA. Although individual non-interest-income diversification ( $H5$ ) has no significant impact on ROA, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and positively related to ROA with the coefficient of 0.9803. Therefore, non-interest-income diversification still increases ROA.

The interaction of international geographic and loan diversifications ( $H1*H3$ ) has significant positive impact on ROA with the coefficient of 0.0365.

#### Sub-period analysis:

Although both the coefficients on domestic geographic diversification ( $H2$ ) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and negatively related to ROA with the coefficient of -0.0116 before the crisis. Therefore, domestic geographic diversification still reduces ROA before the crisis.

Although both the coefficients on loan diversification ( $H3$ ) are insignificant before and during the crisis, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to ROA with the coefficient of -0.0203 before the crisis. Therefore, loan diversification still reduces ROA before the crisis.

The coefficient on security diversification ( $H4$ ) is insignificant before the crisis while

it becomes negatively significant (-0.0369) during the crisis. However, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to ROA with the coefficient of 0.0196 before the crisis. Therefore, security diversification still increases ROA before the crisis.

Although both the coefficients on non-interest-income diversification ( $H5$ ) are insignificant before and during the crisis, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and positively related to ROA with the coefficient of 0.9656 before the crisis. Therefore, non-interest-income diversification still increases ROA before the crisis.

Although both the coefficients on off-balance-sheet diversification ( $H6$ ) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to ROA with the coefficient of 0.0011 during the crisis. Therefore, off-balance-sheet diversification still increases ROA during the crisis.

The coefficient on the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) is insignificant before the crisis while it becomes positively significant (0.0741) during the crisis. The coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is insignificant before the crisis while it becomes negatively significant (-0.5482) during the crisis.

(b) **Risk-adjusted return on asset (RAROA)** –Appendix 51 reports the statistical results.

Total period:

Three types of diversification have significant impacts on RAROA. The impacts of international geographic diversification, loan diversification and non-interest-income diversification are negative. The coefficient on international geographic diversification ( $H1$ ) is -78.2784. The coefficient on loan diversification ( $H3$ ) is -55.1982. The coefficient

on non-interest-income diversification (H3) is -33.6704.

The interaction of international geographic and loan diversifications ( $H1*H3$ ) has significant positive impact on RAROA with the coefficient of 81.6928. The interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ) has significant positive impact on RAROA with the coefficient of 52.4429. The interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) has significant negative impact on RAROA with the coefficient of -29.5276. The interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) has significant positive impact on RAROA with the coefficient of 83.7005.

#### Sub-period analysis:

The coefficient on international geographic diversification (H1) is significantly negative (-100.6305) before the crisis while it becomes insignificant during the crisis. However, the interaction of international geographic diversification and cross-border loan exposure ratio ( $H1*S1$ ) is significantly and negatively related to RAROA with the coefficient of -1.5457 during the crisis. Therefore, international geographic diversification still reduces RAROA during the crisis.

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes negatively significant (-329.6981) during the crisis.

The coefficient on loan diversification (H3) is significantly negative (-74.4565) before the crisis while it becomes insignificant during the crisis. However, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to RAROA with the coefficient of -171.7180. Therefore, loan diversification still reduces RAROA.

The coefficient on security diversification (H4) is insignificant before the crisis while it becomes negatively significant (-65.5254) during the crisis. Moreover, the interaction

of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to RAROA with the coefficient of 158.9234 during the crisis. Therefore, greater security diversification could still improve RAROA with positive net impact of  $-65.5254 + 158.9234 * S4$  if  $S4$  is greater than 0.4124. The results show that the sign of the impact of security diversification depends on the scale of security ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on non-interest-income diversification ( $H5$ ) is significantly negative (-44.6512) before the crisis while it becomes insignificant during the crisis.

The coefficient on off-balance-sheet diversification ( $H6$ ) is insignificant before the crisis while it becomes negatively significant (-36.3439) during the crisis.

The coefficient on the interaction of international geographic and loan diversifications ( $H1*H3$ ) is significantly positive (107.7094) before the crisis while it is significantly negative (-171.0714) during the crisis. The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is insignificant before the crisis while it becomes positively significant (834.4693) during the crisis. The coefficient on the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) is insignificant before the crisis while it becomes positively significant (101.9944) during the crisis.

(c) **Return on equity (ROE)** –Appendix 52 reports the statistical results.

Total period:

Four types of diversification have significant impacts on ROE. The impacts of domestic geographic diversification and loan diversification are negative while the impacts of security diversification and non-interest-income diversification are positive.

Although individual domestic geographic diversification ( $H2$ ) has no significant impact on ROE, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and negatively related to ROE with the coefficient of -0.1202.

Therefore, domestic geographic diversification still reduces ROE. The coefficient on loan diversification (H3) is -0.3174. Although individual security diversification (H4) has no significant impact on ROE, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROE with the coefficient of 0.4503.

Therefore, security diversification still increases ROE. Although individual non-interest-income diversification (H5) has no significant impact on ROE, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to ROE with the coefficient of 18.0231. Therefore, security diversification still increases ROE.

The interaction of international geographic and loan diversifications (H1\*H3) has significant positive impact on ROE with the coefficient of 0.3814. The interaction of security and off-balance-sheet diversifications (H4\*H6) has significant negative impact on ROE with the coefficient of -0.1430.

#### Sub-period analysis:

Although both the coefficients on domestic geographic diversification (H2) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and negatively related to ROE with the coefficient of -0.1594 before the crisis. Therefore, domestic geographic diversification still reduces ROE before the crisis.

Although both the coefficients on loan diversification (H3) are insignificant before and during the crisis, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to ROE with the coefficient of -0.3100 before the crisis. Therefore, loan diversification still reduces ROE before the crisis.

The coefficient on security diversification (H4) is insignificant before the crisis while it becomes negatively significant (-0.4877) during the crisis. However, the interaction of



security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to ROE with the coefficient of 0.2446 before the crisis. Therefore, security diversification still increases ROE before the crisis. On the other hand, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to ROE with the coefficient of 0.8626 during the crisis. Therefore, greater security diversification could still improve ROE with positive net impact of  $-0.4877 + 0.8626 * S4$  if  $S4$  is greater than 0.5654. The results show that the sign of the impact of security diversification depends on the scale of security ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

Although both the coefficients on non-interest-income diversification ( $H5$ ) are insignificant before and during the crisis, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and positively related to ROE with the coefficient of 14.7023 before the crisis. Therefore, non-interest-income diversification still increases ROE before the crisis.

The coefficient on off-balance-sheet diversification ( $H6$ ) is insignificant before the crisis while it becomes negatively significant ( $-0.2679$ ) during the crisis. Moreover, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to ROE with the coefficient of 0.0110 during the crisis. Even if  $S6$  were 1, the net impact of  $-0.2679 + 0.0110 * S6$  would still be negative. Therefore, the impact of off-balance-sheet diversification is negative during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes positively significant (2.3271) during the crisis. The coefficient on the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) is insignificant before the crisis while it becomes positively significant (0.9784) during the crisis. The coefficient on the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) is insignificant

before the crisis while it becomes negatively significant (-6.8405) during the crisis.

(d) **Risk-adjusted return on equity (RAROE)** –Appendix 53 reports the statistical results.

Total period:

Three types of diversification have significant impacts on RAROE. The impacts of international geographic diversification, loan diversification and non-interest-income diversification are negative. The coefficient on international geographic diversification (H1) is -134.3897. The coefficient on loan diversification (H3) is -71.8340. The coefficient on non-interest-income diversification (H5) is -65.4190.

The interaction of international geographic and loan diversifications (H1\*H3) has significant positive impact on RAROE with the coefficient of 115.9632. The interaction of international geographic and non-interest-income diversifications (H1\*H5) has significant positive impact on RAROE with the coefficient of 100.0126. The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant negative impact on RAROE with the coefficient of -43.1060. The interaction of all-activity diversifications (H1\*H2\*H3\*H4\*H5\*H6) has significant positive impact on RAROE with the coefficient of 140.5912.

Sub-period analysis:

The coefficient on international geographic diversification (H1) is significantly negative (-214.7809) before the crisis while it becomes insignificant during the crisis. However, the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1) is significantly and negatively related to RAROE with the coefficient of -2.1174 during the crisis. Therefore, international geographic diversification still reduces RAROE during the crisis.

The coefficient on domestic geographic diversification (H2) is significantly positive

(79.1227) before the crisis while it is significantly negative (-451.5756) during the crisis. Moreover, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to RAROE with the coefficient of 427.9980 during the crisis. Even if  $S2$  were 1, the net impact of  $-451.5756 + 427.9980 * S2$  would still be negative. Therefore, the impact of domestic geographic diversification is negative during the crisis.

The coefficient on loan geographic diversification ( $H3$ ) is significantly negative (-156.4724) before the crisis while it is significantly positive (113.5199) during the crisis. Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to RAROE with the coefficient of -209.7732 during the crisis. Therefore, greater loan diversification could still reduce RAROE with negative net impact of  $113.5199 - 209.7732 * S3$  if  $S3$  is greater than 0.5412. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on security diversification ( $H4$ ) is insignificant before the crisis while it becomes negatively significant (-83.8278) during the crisis. Moreover, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to RAROE with the coefficient of 200.9623 during the crisis. Therefore, greater security diversification could still improve RAROE with positive net impact of  $-83.8278 + 200.9623 * S4$  if  $S4$  is greater than 0.4172. The results show that the sign of the impact of security diversification depends on the scale of security ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on non-interest-income diversification ( $H5$ ) is significantly negative (-88.1935) before the crisis while it becomes insignificant during the crisis.

The coefficient on off-balance-sheet diversification ( $H6$ ) is insignificant before the crisis while it becomes negatively significant (-42.6804) during the crisis.

The coefficient on the interaction of international geographic and loan diversifications ( $H1*H3$ ) is significantly positive (225.9622) before the crisis while it is significantly negative (-230.1052) during the crisis. The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is significantly negative (-89.4125) before the crisis while it is significantly positive (1081.3990) during the crisis. The coefficient on the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) is insignificant before the crisis while it becomes positively significant (129.2267) during the crisis.

**Summary for accounting returns** - Table 64 reports the summary of significant effects of diversifications and interactions for total period. Table 65 reports the summary of significant effects of diversifications and interactions for the sub-periods. 5.2 Market returns

(a) **Stock return (SR)** –Appendix 54 reports the statistical results.

Total period:

Three types of diversification have significant impacts on SR. The impacts of international geographic diversification and loan diversification are negative while the impact of off-balance-sheet diversification is positive.

Although individual international geographic diversification ( $H1$ ) has no significant impact on SR, the interaction of international geographic diversification and cross-border loan exposure ratio ( $H1*S1$ ) is significantly and negatively related to SR with the coefficient of -0.0228. Therefore, international geographic diversification still reduces SR. Although individual loan diversification ( $H3$ ) has no significant impact on SR, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to SR with the coefficient of -2.6280. Therefore, loan diversification still reduces SR. The coefficient on off-balance-sheet diversification ( $H6$ ) is 0.8241.

**Table 64: Summary of Significant Effects of Diversifications for International BHCs  
for Total Period**

		<u>Accounting Returns</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>					
International Geographic Div. (IGD)	H1	-	-		-
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3	-	-	-	-
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5		-		-
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
International Geographic Div. (IGD)	H1*S1				
Domestic Geographic Div. (DGD)	H2*S2	-		-	
Loan Div. (LD)	H3*S3	-		-	
Security Div. (SD)	H4*S4	+		+	
Non-interest-income Div. (NIID)	H5*S5	+		+	
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
IGD*LD	H1*H3	+	+	+	+
IGD*NIID	H1*H5		+		+
DGD * LD	H2*H3				
DGD * NIID	H2*H5		-		-
SD * OBSD	H4*H6			-	
All Activities	H1*H2*H3*H4*H5*H6		+		+

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity  
RAROE: risk-adjusted return on equity

**Table 65: Summary of Significant Effects of Diversifications for International BHCs**

**for Sub-periods**

		Accounting Returns							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>									
International Geographic Div. (IGD)	H1		-		-				
Domestic Geographic Div. (DGD)	H2				+		-		-
Loan Div. (LD)	H3		-		-				+
Security Div. (SD)	H4					-	-	-	-
Non-interest-income Div. (NIID)	H5		-		-				
Off-balance-sheet Div. (OBSD)	H6						-	-	-
<b>Scale interaction</b>									
International Geographic Div. (IGD)	H1*S1						-		-
Domestic Geographic Div. (DGD)	H2*S2	-		-					+
Loan Div. (LD)	H3*S3	-		-			-		-
Security Div. (SD)	H4*S4	+		+			+	+	+
Non-interest-income Div. (NIID)	H5*S5	+		+					
Off-balance-sheet Div. (OBSD)	H6*S6					+		+	
<b>Activity interaction</b>									
IGD*LD	H1*H3		+		+		-		-
IGD*NIID	H1*H5		+		+		+		+
DGD * LD	H2*H3				-		+		+
DGD * NIID	H2*H5		-		-		-	+	-
SD * OBSD	H4*H6					+	+	+	+
All Activities	H1*H2*H3*H4*H5*H6				+	-		-	+

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity

RAROE: risk-adjusted return on equity

The interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) has significant negative impact on SR with the coefficient of -1.3718.

Sub-period analysis:

The coefficient on international geographic diversification ( $H1$ ) is insignificant before the crisis while it becomes positively significant (6.2288) during the crisis. However, the interaction of international geographic diversification and cross-border loan exposure ratio ( $H1*S1$ ) is significantly and negatively related to SR with the coefficient of -0.0359 before the crisis. Therefore, international geographic diversification still reduces SR before the crisis.

The coefficient on security diversification ( $H4$ ) is significantly positive (1.1470) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and negatively related to SR with the coefficient of -1.7564 before the crisis. Therefore, greater security diversification could still reduce SR with negative net impact of  $1.1470 - 1.7564 * S4$  if  $S4$  is greater than 0.6531. The results show that the sign of the impact of security diversification depends on the scale of security ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on off-balance-sheet diversification ( $H6$ ) is significantly positive (1.0575) before the crisis while it becomes insignificant during the crisis.

The coefficient on the interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ) is significantly positive (0.8498) before the crisis while it becomes insignificant during the crisis. The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly negative (-1.8330) before the crisis while it becomes insignificant during the crisis. The coefficient on the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) is

significantly negative (-1.3643) before the crisis while it becomes insignificant during the crisis.

(b) **Risk-adjusted stock return (RASR)** –Appendix 55 reports the statistical results.

Total period:

Three types of diversification have significant impacts on RASR. The impacts of international geographic diversification and loan diversification are negative while the impact of off-balance-sheet diversification is positive.

Although individual international geographic diversification (H1) has no significant impact on RASR, the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1) is significantly and negatively related to RASR with the coefficient of -0.1460. Therefore, international geographic diversification still reduces RASR. Although individual loan diversification (H3) has no significant impact on RASR, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to RASR with the coefficient of -15.3783. Therefore, loan diversification still reduces RASR. The coefficient on off-balance-sheet diversification (H6) is 3.0290.

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant negative impact on RASR with the coefficient of -10.2076.

Sub-period analysis:

The coefficient on international geographic diversification (H1) is insignificant before the crisis while it becomes positively significant (64.4689) during the crisis. However, the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1) is significantly and negatively related to RASR with the coefficient of -0.2107 before the crisis. Therefore, international geographic diversification still reduces RASR before the crisis.



The coefficient on loan diversification (H3) is insignificant before the crisis while it becomes positively significant (74.9838) during the crisis. However, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to RASR with the coefficient of -12.1785 before the crisis. Therefore, loan diversification still reduces RASR before the crisis.

The coefficient on security diversification (H4) is significantly positive (5.3929) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of security diversification and security ratio (H4\*S4) is significantly and negatively related to RASR with the coefficient of -8.1406 before the crisis. Therefore, greater security diversification could still reduce RASR with negative net impact of  $5.3929 - 8.1406 * S4$  if  $S4$  is greater than 0.6625. The results show that the sign of the impact of security diversification depends on the scale of security ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on non-interest-income diversification (H5) is significantly positive (5.5825) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to RASR with the coefficient of -704.1505 before the crisis. Therefore, greater non-interest-income diversification could still reduce RASR with negative net impact of  $5.5825 - 704.1505 * S5$  if  $S5$  is greater than 0.0080. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on off-balance-sheet diversification (H6) is significantly positive (4.7303) before the crisis while it becomes insignificant during the crisis.

The coefficient on the interaction of international geographic and loan diversifications (H1\*H3) is insignificant before the crisis while it becomes negatively significant

(-115.6986) during the crisis. In addition, the coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly negative (-12.7469) before the crisis while it becomes insignificant during the crisis.

**Summary for market returns** - Table 66 reports the summary of significant effects of diversifications and interactions for total period. Table 67 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 5.3 Credit risk

**Net charge-offs (NCO)** –Appendix 56 reports the statistical results. Total period:

Four types of diversification have significant impacts on NCO. The impacts of international geographic diversification, loan diversification, non-interest-income diversification and off-balance-sheet diversification are positive. The coefficient on international geographic diversification ( $H1$ ) is 0.0055. Although individual loan diversification ( $H3$ ) has no significant impact on NCO, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and positively related to NCO with the coefficient of 0.0093. Therefore, loan diversification still increases NCO. The coefficient on non-interest-income diversification ( $H5$ ) is 0.0070. Although individual off-balance-sheet diversification ( $H6$ ) has no significant impact on NCO, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and positively related to NCO with the coefficient of 0.0001. Therefore, off-balance-sheet diversification still increases NCO. The interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ) has significant negative impact on NCO with the coefficient of -0.0056.

**Table 66: Summary of Significant Effects of Diversifications  
for International BHCs for Total Period**

		<u>Market Returns</u>	
	Variable Abbreviation	SR	RASR
<b>Activity diversification</b>			
International Geographic Div. (IGD)	H1		
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5		
Off-balance-sheet Div. (OBSD)	H6	+	+
<b>Scale interaction</b>			
International Geographic Div. (IGD)	H1*S1	-	-
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3	-	-
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
IGD*LD	H1*H3		
IGD*NIID	H1*H5		
DGD * LD	H2*H3		
DGD * NIID	H2*H5	-	-
SD * OBSD	H4*H6		
All Activities	H1 *H2*H3*H4*H5*H6		

SR: stock return

RASR: risk-adjusted stock return

**Table 67: Summary of Significant Effects of Diversifications for International BHCs  
for Sub-periods**

Variable Abbreviation		Market Returns			
		<u>Before The Crisis</u>		<u>During The Crisis</u>	
		SR	RASR	SR	RASR
<b>Activity diversification</b>					
International Geographic Div. (IGD)	H1			+	+
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3	+		+	+
Security Div. (SD)	H4	+	+		
Non-interest-income Div. (NIID)	H5		+		
Off-balance-sheet Div. (OBSD)	H6	+	+		
<b>Scale interaction</b>					
International Geographic Div. (IGD)	H1*S1	-	-		
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3	-	-		
Security Div. (SD)	H4*S4	-	-		
Non-interest-income Div. (NIID)	H5*S5		-		
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
IGD*LD	H1*H3	-		-	-
IGD*NIID	H1*H5	+			
DGD * LD	H2*H3				
DGD * NIID	H2*H5	-	-		
SD * OBSD	H4*H6	-			
All Activities	H1*H2*H3*H4*H5*H6				

SR: stock return      RASR: risk-adjusted stock return

### Sub-period analysis:

Although both the coefficients on loan diversification (H3) are insignificant before and during the crisis, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and positively related to NCO with the coefficient of 0.0130 before the crisis. Therefore, loan diversification still increases NCO before the crisis.

The coefficient on security diversification (H4) is significantly positive (0.0055) before the crisis while it becomes insignificant during the crisis.

The coefficient on non-interest-income diversification (H5) is significantly positive (0.0098) before the crisis while it becomes insignificant during the crisis.

Although both the coefficients on off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and positively related to NCO with the coefficient of 0.0001 before the crisis. Therefore, off-balance-sheet diversification still increases NCO before the crisis.

The coefficient on the interaction of international geographic and non-interest-income diversifications (H1\*H5) is significantly negative (-0.0081) before the crisis while it becomes insignificant during the crisis. In addition, the coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is significantly negative (-0.0094) before the crisis while it becomes insignificant during the crisis.

**Summary for credit risk** - Table 68 reports the summary of significant effects of diversifications and interactions for total period. Table 69 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 5.4 Market risk

(a) **Maturity gap (MG)** –Appendix 57 reports the statistical results.

#### Total period:

Three types of diversification have significant impacts on MG. The impacts of international geographic diversification and loan diversification are positive while the impact of domestic geographic diversification is negative.

The coefficient on international geographic diversification (H1) is 0.8216. The coefficient on domestic geographic diversification (H2) is -1.7115. The coefficient on loan diversification (H3) is 1.6223. Moreover, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to MG with the coefficient of -0.9589. Even if S3 were 1, the net impact of  $1.6223 - 0.9589 * S3$  would still be positive. Therefore, the impact of loan diversification is positive.

The interaction of international geographic and loan diversifications (H1\*H3) has significant negative impact on MG with the coefficient of -1.8756. The interaction of domestic geographic and loan diversifications (H2\*H3) has significant positive impact on MG with the coefficient of 1.7536. The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant positive impact on MG with the coefficient of 0.7095.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly negative (-1.5258) before the crisis while it becomes insignificant during the crisis. Although both the coefficients on loan diversification (H3) are insignificant before and during the crisis, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and positively related to MG with the coefficient of 5.6413 during the crisis. Therefore, loan diversification still increases MG during the crisis. The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is significantly positive (1.6140) before the crisis while it is significantly negative (-7.2756) during the crisis.

**Table 68: Summary of Significant Effects of Diversifications  
for International BHCs for Total Period**

		<u>Credit Risk</u>
	Variable Abbreviation	NCO
<b>Activity diversification</b>		
International Geographic Div. (IGD)	H1	+
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	+
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
International Geographic Div. (IGD)	H1*S1	
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	+
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	+
<b>Activity interaction</b>		
IGD*LD	H1*H3	
IGD*NIID	H1*H5	-
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H1*H2*H3*H4*H5*H6	

NCO: net charge-offs

**Table 69: Summary of Significant Effects of Diversifications for International BHCs  
for Sub-periods**

		Credit Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	NCO	NCO
<b>Activity diversification</b>			
International Geographic Div. (IGD)	H1		
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		
Security Div. (SD)	H4	+	
Non-interest-income Div. (NIID)	H5	+	
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
International Geographic Div. (IGD)	H1*S1		
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3	+	
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6	+	
<b>Activity interaction</b>			
IGD*LD	H1*H3		
IGD*NIID	H1*H5	-	
DGD * LD	H2*H3		
DGD * NIID	H2*H5		
SD * OBSD	H4*H6	-	
All Activities	H1*H2*H3*H4*H5*H6		

NCO: net charge-offs



In addition, the coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly positive (0.7174) before the crisis while it becomes insignificant during the crisis.

(b) **Derivatives loss (DL)** – Appendix 58 reports the statistical results.

Total period:

Loan diversification ( $H3$ ) has significant impact on DL. The impact is positive with the coefficient of 0.0004.

The interaction of international geographic and loan diversifications ( $H1*H3$ ) has significant negative impact on DL with the coefficient of -0.0005.

Sub-period analysis:

Although both the coefficients on domestic geographic diversification ( $H2$ ) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to DL with the coefficient of 0.0147 during the crisis. Therefore, domestic geographic diversification still increases DL during the crisis.

Although both the coefficients on loan diversification ( $H3$ ) are insignificant before and during the crisis, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and positively related to DL with the coefficient of 0.0051 during the crisis. Therefore, loan diversification still increases DL during the crisis.

Although both the coefficients on non-interest-income diversification ( $H5$ ) are insignificant before and during the crisis, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and positively related to DL with the coefficient of 0.0975 during the crisis. Therefore, non-interest-income diversification still increases DL during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income

diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes negatively significant (-0.0079) during the crisis. The coefficient on the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) is insignificant before the crisis while it becomes positively significant (0.0315) during the crisis.

(c) **Market beta (MB)** – Appendix 59 reports the statistical results.

Total period:

Two types of diversification have significant impacts on MB. The impacts of international geographic diversification and security diversification are positive. Although individual international geographic diversification ( $H1$ ) has no significant impact on MB, the interaction of international geographic diversification and cross-border loan exposure ratio ( $H1*S1$ ) is significantly and positively related to MB with the coefficient of 0.0126. Therefore, international geographic diversification still increases MB. The coefficient on security diversification ( $H4$ ) is 0.6125.

The interaction of international geographic and loan diversifications ( $H1*H3$ ) has significant negative impact on MB with the coefficient of -1.5262. In addition, the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) has significant negative impact on MB with the coefficient of -1.0092.

Sub-period analysis:

Although both the coefficients on domestic geographic diversification ( $H2$ ) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ) is significantly and positively related to MB with the coefficient of 27.8847 during the crisis. Therefore, domestic geographic diversification still increases MB during the crisis.

The coefficient on security diversification ( $H4$ ) is insignificant before the crisis while it becomes positively significant (9.2622) during the crisis.

Although both the coefficients on off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and positively related to MB with the coefficient of 0.1305 during the crisis. Therefore, off-balance-sheet diversification still increases MB during the crisis.

The coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is insignificant before the crisis while it becomes negatively significant (-13.3629) during the crisis.

(d) **Interest rate beta (IRB)** –Appendix 60 reports the statistical results.

Total period:

Only loan diversification (H3) has significant impact on IRB. The impact is negative with the coefficient of -1.1887.

Sub-period analysis:

Although both the coefficients on international geographic diversification (H1) are insignificant before and during the crisis, the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1) is significantly and positively related to IRB with the coefficient of 0.0158 before the crisis. Therefore, international geographic diversification still increases IRB before the crisis.

Although both the coefficients on security diversification (H4) are insignificant before and during the crisis, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to IRB with the coefficient of 1.5817 before the crisis. Therefore, security diversification still increases IRB before the crisis.

**Summary for market risk** - Table 70 reports the summary of significant effects of diversifications and interactions for total period. Table 71 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## 5.5 Default risk

**Distance to default (Z-score)** –Appendix 61 reports the statistical results.

Total period:

Three types of diversification have significant impacts on Z. The impacts of international geographic diversification, loan diversification and non-interest-income diversification are negative. The coefficient on international geographic diversification (H1) is -1395.75. The coefficient on loan diversification (H3) is -821.88. The coefficient on non-interest-income diversification (H5) is -467.28.

The interaction of international geographic and loan diversifications (H1\*H3) has significant positive impact on Z with the coefficient of 1409.05. The interaction of international geographic and non-interest-income diversifications (H1\*H5) has significant positive impact on Z with the coefficient of 909.63. The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant negative impact on Z with the coefficient of -675.30. The interaction of all-activity diversifications (H1\*H2\*H3\*H4\*H5\*H6) has significant positive impact on Z with the coefficient of 1987.77.

Sub-period analysis:

The coefficient on international geographic diversification (H1) is significantly negative (-1760.68) before the crisis while it becomes insignificant during the crisis. The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes negatively significant (-6594.94) during the crisis. Although both the coefficients on loan diversification (H3) are insignificant before and during the crisis, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to Z with the coefficient of -3584.68 during the crisis. Therefore, loan

**Table 70: Summary of Significant Effects of Diversifications for International BHCs**  
**for Total Period**

		<u>Market Risk</u>			
	Variable Abbreviation	MG	DL	MB	IRB
<b>Activity diversification</b>					
International Geographic Div. (IGD)	H1	+			
Domestic Geographic Div. (DGD)	H2	-			
Loan Div. (LD)	H3	+	+		-
Security Div. (SD)	H4			+	
Non-interest-income Div. (NIID)	H5				
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
International Geographic Div. (IGD)	H1*S1			+	
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3	-			
Security Div. (SD)	H4*S4				
Non-interest-income Div. (NIID)	H5*S5				
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
IGD*LD	H1*H3	-	-	-	
IGD*NIID	H1*H5				
DGD * LD	H2*H3	+			
DGD * NIID	H2*H5	+			
SD * OBSD	H4*H6			-	
All Activities	H1*H2*H3*H4*H5*H6				

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

**Table 71: Summary of Significant Effects of Diversifications for International BHCs**

**for Sub-periods**

		Market Risk							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable Abbreviation	MG	DL	MB	IRB	MG	DL	MB	IRB
<b>Activity diversification</b>									
International Geographic Div. (IGD)	H1								
Domestic Geographic Div. (DGD)	H2	-							
Loan Div. (LD)	H3								
Security Div. (SD)	H4							+	
Non-interest-income Div. (NIID)	H5								
Off-balance-sheet Div. (OBS)	H6				-				
<b>Scale interaction</b>									
International Geographic Div. (IGD)	H1*S1				+				
Domestic Geographic Div. (DGD)	H2*S2						+	+	
Loan Div. (LD)	H3*S3					+	+		
Security Div. (SD)	H4*S4				+				
Non-interest-income Div. (NIID)	H5*S5						+		
Off-balance-sheet Div. (OBS)	H6*S6							+	
<b>Activity interaction</b>									
IGD*LD	H1*H3								
IGD*NIID	H1*H5								
DGD * LD	H2*H3	+				-			
DGD * NIID	H2*H5	+					-		
SD * OBS	H4*H6							-	
All Activities	H1*H2*H3*H4*H5*H6						+		

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

diversification still reduces Z during the crisis. The coefficient on security diversification (H4) is insignificant before the crisis while it becomes negatively significant (-1341.74) during the crisis. Moreover, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to Z with the coefficient of 3209.13 during the crisis. Therefore, greater security diversification could still increase Z with positive net impact of  $-1341.74 + 3209.13 * S4$  if S4 is greater than 0.4182. The results show that the sign of the impact of security diversification depends on the scale of security ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive. The coefficient on non-interest-income diversification (H5) is significantly negative (-701.84) before the crisis while it becomes insignificant during the crisis. The coefficient on off-balance-sheet diversification (H6) is insignificant before the crisis while it becomes negatively significant (-780.29) during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is insignificant before the crisis while it becomes positively significant (15317.57) during the crisis. In addition, the coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is insignificant before the crisis while it becomes positively significant (1855.05) during the crisis.

**Summary for default risk** - Table 72 reports the summary of significant effects of diversifications and interactions for total period. Table 73 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## **SUMMARY OF DIVERSIFICATION AND INTERACTION EFFECTS FOR INTERNATIONAL BHCs**

a. Total period: Table 74 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - The interaction of security diversification and security ratio

(H4\*S4), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of international geographic and loan diversifications (H1\*H3), the interaction of international geographic and non-interest-income diversifications (H1\*H5), and the interaction of all-activity diversifications (H1\*H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification (H1), loan diversification (H3), non-interest-income diversification (H5), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of domestic geographic and non-interest-income diversifications (H2\*H5), and the interaction of security and off-balance-sheet diversifications (H4\*H6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Off-balance-sheet diversification (H6) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - The interaction of international geographic and non-interest-income diversifications (H1\*H5) benefit BHCs with their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification (H1), non-interest-income diversification (H5), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of off-balance-sheet



**Table 72: Summary of Significant Effects of Diversifications  
for International BHCs for Total Period**

		<u>Default Risk</u>
	Variable Abbreviation	Z
<b>Activity diversification</b>		
International Geographic Div. (IGD)	H1	-
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	-
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	-
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
International Geographic Div. (IGD)	H1*S1	
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	-
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
IGD*LD	H1*H3	+
IGD*NIID	H1*H5	+
DGD * LD	H2*H3	
DGD * NIID	H2*H5	-
SD * OBSD	H4*H6	
All Activities	H1*H2*H3*H4*H5*H6	+

Z: distance to default

**Table 73: Summary of Significant Effects of Diversifications  
for International BHCs for Sub-periods**

		Default Risk	
		Before The Crisis	During The Crisis
	Variable Abbreviation	Z	Z
<b>Activity diversification</b>			
International Geographic Div. (IGD)	H1	-	
Domestic Geographic Div. (DGD)	H2		-
Loan Div. (LD)	H3		
Security Div. (SD)	H4		-
Non-interest-income Div. (NIID)	H5	-	
Off-balance-sheet Div. (OBSD)	H6		-
<b>Scale interaction</b>			
International Geographic Div. (IGD)	H1*S1		
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		-
Security Div. (SD)	H4*S4		+
Non-interest-income Div. (NIID)	H5*S5	-	
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
IGD*LD	H1*H3		
IGD*NIID	H1*H5	+	+
DGD * LD	H2*H3		+
DGD * NIID	H2*H5	-	-
SD * OBSD	H4*H6		+
All Activities	H1*H2*H3*H4*H5*H6	+	+

Z: distance to default

diversification and off-balance-sheet ratio ( $H6*S6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Domestic geographic diversification ( $H2$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of international geographic and loan diversifications ( $H1*H3$ ), and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification ( $H1$ ), loan diversification ( $H3$ ), security diversification ( $H4$ ), the interaction of international geographic diversification and cross-border loan exposure ratio ( $H1*S1$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - The interaction of international geographic and loan diversifications ( $H1*H3$ ), the interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ), and the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification ( $H1$ ), loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**Table 74: Number and Percentage of Significant Effects of Diversifications and Interactions for International BHCs for Total Period**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
Activity diversification																			
International Geographic Div. (IGD)	H1	0	3	3	0	0	0	0	1	1	0	1	1	0	1	1	0	6	6
Domestic Geographic Div. (DGD)	H2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
Loan Div. (LD)	H3	0	4	4	0	0	0	0	0	0	1	2	3	0	1	1	1	7	8
Security Div. (SD)	H4	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Non-interest-income Div. (NIID)	H5	0	2	2	0	0	0	0	1	1	0	0	0	0	1	1	0	4	4
Off-balance-sheet Div. (OBSD)	H6	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	2	0	2
Scale interaction																			
International Geographic Div. (IGD)	H1*S1	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	3	3
Domestic Geographic Div. (DGD)	H2*S2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Loan Div. (LD)	H3*S3	0	2	2	0	2	2	0	1	1	1	0	1	0	0	0	1	5	6
Security Div. (SD)	H4*S4	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Non-interest-income Div. (NIID)	H5*S5	2	0	2	0	0	0	0	0	0	0	0	0	0	1	1	2	1	3
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1
Activity interaction																			
IGD*LD	H1*H3	4	0	4	0	0	0	0	0	0	3	0	3	1	0	1	8	0	8
IGD*NIID	H1*H5	2	0	2	0	0	0	1	0	1	0	0	0	1	0	1	4	0	4
DGD * LD	H2*H3	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
DGD * NIID	H2*H5	0	2	2	0	2	2	0	0	0	0	1	1	0	1	1	0	6	6
SD * OBSD	H4*H6	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	2
All Activities	H1*H2*H3*H4*H5*H6	2	0	2	0	0	0	0	0	0	0	0	0	1	0	1	3	0	3

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
International Geographic Div. (IGD)	H1	0	75	75	0.00	0	0	0	.	0	100	100	0.00	0	25	25	0.00	0	100	100	0.00	0	50	50	0.00
Domestic Geographic Div. (DGD)	H2	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	0	8	X
Loan Div. (LD)	H3	0	100	100	0.00	0	0	0	.	0	0	0	.	25	50	75	0.50	0	100	100	0.00	8	58	67	0.14
Security Div. (SD)	H4	0	0	0	.	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	8	8	0.00
Non-interest-income Div. (NIID)	H5	0	50	50	0.00	0	0	0	.	0	100	100	0.00	0	0	0	.	0	100	100	0.00	0	33	33	0.00
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Scale interaction																									
International Geographic Div. (IGD)	H1*S1	0	0	0	.	0	100	100	0.00	0	0	0	.	0	25	25	0.00	0	0	0	.	0	25	25	0.00
Domestic Geographic Div. (DGD)	H2*S2	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Loan Div. (LD)	H3*S3	0	50	50	0.00	0	100	100	0.00	0	100	100	0.00	25	0	25	X	0	0	0	.	8	42	50	0.19
Security Div. (SD)	H4*S4	50	0	50	X	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Non-interest-income Div. (NIID)	H5*S5	50	0	50	X	0	0	0	.	0	0	0	.	0	0	0	.	0	100	100	0.00	17	8	25	2.13
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	100	100	0.00	0	0	0	.	0	0	0	.	0	8	8	0.00
Activity interaction																									
IGD*LD	H1*H3	100	0	100	X	0	0	0	.	0	0	0	.	75	0	75	X	100	0	100	X	67	0	67	X
IGD*NIID	H1*H5	50	0	50	X	0	0	0	.	100	0	100	x	0	0	0	.	100	0	100	X	33	0	33	X
DGD * LD	H2*H3	0	0	0	.	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	8	8	0.00
DGD * NIID	H2*H5	0	50	50	0.00	0	100	100	0.00	0	0	0	.	0	25	25	0.00	0	100	100	0.00	0	50	50	0.00
SD * OBSD	H4*H6	0	25	25	0.00	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	8	17	1.00
All Activities	H1*H2*H3*H4*H5*H6	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	x	25	0	25	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

b. Before the crisis: Table 75 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Domestic geographic diversification (H2), the interaction of security diversification and security ratio (H4\*S4), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of international geographic and loan diversifications (H1\*H3), the interaction of international geographic and non-interest-income diversifications (H1\*H5), and the interaction of all-activity diversifications (H1\*H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification (H1), loan diversification (H3), non-interest-income diversification (H5), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Loan diversification (H3), security diversification (H4), non-interest-income diversification (H5), off-balance-sheet diversification (H6), and the interaction of international geographic and non-interest-income diversifications (H1\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of security diversification and security ratio (H4\*S4), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of international geographic and loan diversifications (H1\*H3), the interaction of domestic geographic and non-interest-income

diversifications ( $H2*H5$ ), and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - The interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ) and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ), non-interest-income diversification ( $H5$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), and the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Domestic geographic diversification ( $H2$ ) and off-balance-sheet diversification ( $H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of international geographic diversification and cross-border loan exposure ratio ( $H1*S1$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - The interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ) and the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification ( $H1$ ), non-interest-income diversification ( $H5$ ), the interaction of non-interest-income diversification and non-interest-income ratio

**Table 75: Number and Percentage of Significant Effects of Diversifications and Interactions for International BHCs Before The Crisis**

(Number)	Variable Abbreviation	(n=4) Accounting Returns			(n=2) Market Returns			(n=1) Credit Risk			(n=4) Market Risk			(n=1) Default Risk			(n=12) All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
Activity diversification																			
International Geographic Div. (IGD)	H1	0	2	2	0	0	0	0	0	0	0	0	0	1	1	0	3	3	
Domestic Geographic Div. (DGD)	H2	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	2	0	2
Loan Div. (LD)	H3	0	2	2	1	0	1	0	0	0	0	0	0	0	0	0	1	2	3
Security Div. (SD)	H4	0	0	0	2	0	2	0	1	1	0	0	0	0	0	0	2	1	3
Non-interest-income Div. (NIID)	H5	0	2	2	1	0	1	0	1	1	0	0	0	0	1	1	1	4	5
Off-balance-sheet Div. (OBSD)	H6	0	0	0	2	0	2	0	0	0	1	0	1	0	0	0	3	0	3
Scale interaction																			
International Geographic Div. (IGD)	H1*S1	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	3	3
Domestic Geographic Div. (DGD)	H2*S2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Loan Div. (LD)	H3*S3	0	2	2	0	2	2	0	1	1	0	0	0	0	0	0	0	5	5
Security Div. (SD)	H4*S4	2	0	2	0	2	2	0	0	0	0	1	1	0	0	0	2	3	5
Non-interest-income Div. (NIID)	H5*S5	2	0	2	0	1	1	0	0	0	0	0	0	0	1	1	2	2	4
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1
Activity interaction																			
IGD*LD	H1*H3	2	0	2	0	1	1	0	0	0	0	0	0	0	0	0	2	1	3
IGD*NIID	H1*H5	2	0	2	1	0	1	1	0	1	0	0	0	1	0	1	5	0	5
DGD * LD	H2*H3	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2
DGD * NIID	H2*H5	0	2	2	0	2	2	0	0	0	0	1	1	0	1	1	0	6	6
SD * OBSD	H4*H6	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	1	2
All Activities	H1*H2*H3*H4*H5*H6	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	2	0	2

( % )	Variable Abbreviation	Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
		+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
International Geographic Div. (IGD)	H1	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	100	100	0.00	0	25	25	0.00
Domestic Geographic Div. (DGD)	H2	25	0	25	X	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	17	0	17	X
Loan Div. (LD)	H3	0	50	50	0.00	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	8	17	25	0.47
Security Div. (SD)	H4	0	0	0	.	100	0	100	x	0	100	100	0.00	0	0	0	.	0	0	0	.	17	8	25	2.13
Non-interest-income Div. (NIID)	H5	0	50	50	0.00	50	0	50	x	0	100	100	0.00	0	0	0	.	0	100	100	0.00	8	33	42	0.24
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	100	0	100	x	0	0	0	.	25	0	25	x	0	0	0	.	25	0	25	X
Scale interaction																									
International Geographic Div. (IGD)	H1*S1	0	0	0	.	0	100	100	0.00	0	0	0	.	0	25	25	0.00	0	0	0	.	0	25	25	0.00
Domestic Geographic Div. (DGD)	H2*S2	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Loan Div. (LD)	H3*S3	0	50	50	0.00	0	100	100	0.00	0	100	100	0.00	0	0	0	.	0	0	0	.	0	42	42	0.00
Security Div. (SD)	H4*S4	50	0	50	X	0	100	100	0.00	0	0	0	.	0	25	25	0.00	0	0	0	.	17	25	42	0.68
Non-interest-income Div. (NIID)	H5*S5	50	0	50	X	0	50	50	0.00	0	0	0	.	0	0	0	.	0	100	100	0.00	17	17	33	1.00
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	100	100	0.00	0	0	0	.	0	0	0	.	0	8	8	0.00
Activity interaction																									
IGD*LD	H1*H3	50	0	50	X	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	17	8	25	2.13
IGD*NIID	H1*H5	50	0	50	X	50	0	50	X	100	0	100	x	0	0	0	.	100	0	100	X	42	0	42	X
DGD * LD	H2*H3	0	25	25	0.00	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	17	17	0.00
DGD * NIID	H2*H5	0	50	50	0.00	0	100	100	0.00	0	0	0	.	0	25	25	0.00	0	100	100	0.00	0	50	50	0.00
SD * OBSD	H4*H6	0	0	0	.	0	50	50	0.00	100	0	100	x	0	0	0	.	0	0	0	.	8	8	17	1.00
All Activities	H1*H2*H3*H4*H5*H6	25	0	25	x	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	x	17	0	17	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

(H5\*S5), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

c. During the crisis: Table 76 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Loan diversification (H3), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of security diversification and security ratio (H4\*S4), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of international geographic and non-interest-income diversifications (H1\*H5), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2), security diversification (H4), off-balance-sheet diversification (H6), the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of international geographic and loan diversifications (H1\*H3), the interaction of domestic geographic and non-interest-income diversifications (H2\*H5), and the interaction of all-activity diversifications (H1\*H2\*H3\*H4\*H5\*H6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - International geographic diversification (H1) and loan diversification (H3) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of international geographic and loan diversifications (H1\*H3) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.



**For credit risk** – No diversifications or interactions advantage BHCs.

**For market risk** - The interaction of domestic geographic and loan diversifications ( $H2*H3$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ), the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), and the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - The interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification ( $H2$ ), security diversification ( $H4$ ), off-balance-sheet diversification ( $H6$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

## **6 All BHCs**

### **6.1 Accounting returns**

**Table 76: Number and Percentage of Significant Effects of Diversifications and Interactions for International BHCs During The Crisis**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
Activity diversification																			
International Geographic Div. (IGD)	H1	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	2	0	2
Domestic Geographic Div. (DGD)	H2	0	2	2	0	0	0	0	0	0	0	0	0	0	1	1	0	3	3
Loan Div. (LD)	H3	1	0	1	2	0	2	0	0	0	0	0	0	0	0	0	3	0	3
Security Div. (SD)	H4	0	4	4	0	0	0	0	0	0	0	1	1	0	1	1	0	6	6
Non-interest-income Div. (NIID)	H5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Off-balance-sheet Div. (OBSD)	H6	0	3	3	0	0	0	0	0	0	0	0	0	0	1	1	0	4	4
Scale interaction																			
International Geographic Div. (IGD)	H1*S1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Domestic Geographic Div. (DGD)	H2*S2	1	0	1	0	0	0	0	0	0	0	2	2	0	0	0	1	2	3
Loan Div. (LD)	H3*S3	0	2	2	0	0	0	0	0	0	0	2	2	0	1	1	0	5	5
Security Div. (SD)	H4*S4	3	0	3	0	0	0	0	0	0	0	0	0	1	0	1	4	0	4
Non-interest-income Div. (NIID)	H5*S5	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Off-balance-sheet Div. (OBSD)	H6*S6	2	0	2	0	0	0	0	0	0	0	1	1	0	0	0	2	1	3
Activity interaction																			
IGD*LD	H1*H3	0	2	2	0	2	2	0	0	0	0	0	0	0	0	0	0	4	4
IGD*NIID	H1*H5	2	0	2	0	0	0	0	0	0	0	0	0	1	0	1	3	0	3
DGD * LD	H2*H3	2	0	2	0	0	0	0	0	0	1	0	1	1	0	1	4	0	4
DGD * NIID	H2*H5	1	2	3	0	0	0	0	0	0	1	0	1	0	1	1	2	3	5
SD * OBSD	H4*H6	4	0	4	0	0	0	0	0	0	1	0	1	1	0	1	6	0	6
All Activities	H1*H2*H3*H4*H5*H6	1	2	3	0	0	0	0	0	0	0	1	1	1	0	1	2	3	5

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
International Geographic Div. (IGD)	H1	0	0	0	.	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	x
Domestic Geographic Div. (DGD)	H2	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	100	100	0.00	0	25	25	0.00
Loan Div. (LD)	H3	25	0	25	X	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X
Security Div. (SD)	H4	0	100	100	0.00	0	0	0	.	0	0	0	.	0	25	25	0.00	0	100	100	0.00	0	50	50	0.00
Non-interest-income Div. (NIID)	H5	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Off-balance-sheet Div. (OBSD)	H6	0	75	75	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	100	100	0.00	0	33	33	0.00
Scale interaction																									
International Geographic Div. (IGD)	H1*S1	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Domestic Geographic Div. (DGD)	H2*S2	25	0	25	X	0	0	0	.	0	0	0	.	0	50	50	0.00	0	0	0	.	8	17	25	0.47
Loan Div. (LD)	H3*S3	0	50	50	0.00	0	0	0	.	0	0	0	.	0	50	50	0.00	0	100	100	0.00	0	42	42	0.00
Security Div. (SD)	H4*S4	75	0	75	X	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	X	33	0	33	X
Non-interest-income Div. (NIID)	H5*S5	0	0	0	.	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	8	8	0.00
Off-balance-sheet Div. (OBSD)	H6*S6	50	0	50	X	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	17	8	25	2.13
Activity interaction																									
IGD*LD	H1*H3	0	50	50	0.00	0	100	100	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	33	33	0.00
IGD*NIID	H1*H5	50	0	50	X	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	X	25	0	25	X
DGD * LD	H2*H3	50	0	50	X	0	0	0	.	0	0	0	.	25	0	25	X	100	0	100	X	33	0	33	X
DGD * NIID	H2*H5	25	50	75	0.50	0	0	0	.	0	0	0	.	25	0	25	X	0	100	100	0.00	17	25	42	0.68
SD * OBSD	H4*H6	100	0	100	X	0	0	0	.	0	0	0	.	25	0	25	X	100	0	100	x	50	0	50	X
All Activities	H1*H2*H3*H4*H5*H6	25	50	75	0.50	0	0	0	.	0	0	0	.	0	25	25	0.00	100	0	100	x	17	25	42	0.68

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

(a) **Return on asset (ROA)** –Appendix 62 reports the statistical results.

Total period:

Four types of diversification have significant impacts on ROA. They are domestic geographic diversification, loan diversification, security diversification and non-interest-income diversification. The coefficient on domestic geographic diversification (H2) is -0.0116. The coefficient on loan diversification (H3) is 0.0064. However, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to ROA with the coefficient of -0.0102. Therefore, greater non-interest-income diversification could still reduce ROA with negative net impact of  $0.0064 - 0.0102 * S3$  if S3 is greater than 0.6275. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on security diversification (H4) is -0.0015. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROA with the coefficient of 0.0048. Therefore, greater security diversification could still improve ROA with positive net impact of  $-0.0015 + 0.0048 * S4$  if S4 is greater than 0.3125. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

The coefficient on non-interest-income diversification (H5) is 0.0024. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to ROA with the coefficient of -0.3824. Therefore, greater non-interest-income diversification could still reduce ROA with negative net impact of  $0.0024 - 0.3824 * S5$  if S5 is greater than 0.0063. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio. If the ratio is large enough, the impact turns from positive to

negative.

The interaction of domestic geographic and loan diversifications (H2\*H3) has significant positive impact on ROA with the coefficient of 0.0087. In addition, the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant positive impact on ROA with the coefficient of 0.0052.

#### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is significantly negative (-0.0118) before the crisis while it becomes insignificant during the crisis. The coefficient on security diversification (H4) is significantly negative (-0.0014) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROA with the coefficient of 0.0030 before the crisis. Therefore, greater security diversification could still improve ROA with positive net impact of  $-0.0014 + 0.0030 * S4$  if  $S4$  is greater than 0.4667. The results show that the sign of the impact of security diversification depends on the scale of security ratio before the crisis. If the ratio is large enough, the impact turns from negative to positive.

Both the coefficients on non-interest-income diversification (H5) before and during the crisis are significantly positive (0.0025 and 0.0026, respectively). Moreover, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to ROA with the coefficient of -0.3742 before the crisis. Therefore, greater non-interest-income diversification could still reduce ROA with negative net impact of  $0.0025 - 0.3742 * S5$  if  $S5$  is greater than 0.0067. The results show that the sign of the impact of non-interest-income diversification depends on the scale of non-interest-income ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative.

The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is significantly positive (0.0108) before the crisis while it becomes insignificant during the crisis. In addition, the coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly positive (0.0033) before the crisis while it becomes insignificant during the crisis.

(b) **Risk-adjusted return on asset (RAROA)** –Appendix 63 reports the statistical results.

Total period:

Two types of diversification have significant impacts on RAROA. The impacts of security diversification and non-interest-income diversification are positive. Although individual security diversification ( $H4$ ) has no significant impact on RAROA, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to RAROA with the coefficient of 4.9704. Therefore, security diversification still increases RAROA. The coefficient on non-interest-income diversification ( $H5$ ) is 1.0896.

Sub-period analysis:

The coefficient on domestic geographic diversification ( $H2$ ) is insignificant before the crisis while it becomes positively significant (16.1598) during the crisis. Both the coefficients on loan diversification ( $H3$ ) before and during the crisis are significantly positive (9.4096 and 12.7155, respectively). Moreover, the interaction of loan diversification and loan ratio ( $H3*S3$ ) is significantly and negatively related to RAROA with the coefficient of -16.1682 before the crisis. Therefore, greater loan diversification could still reduce RAROA with negative net impact of  $9.4096 - 16.1682 * S3$  if  $S3$  is greater than 0.5820. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact

turns from positive to negative. The coefficient on security diversification (H4) is insignificant before the crisis while it becomes positively significant (4.3269) during the crisis. In addition, the coefficient on non-interest-income diversification (H5) is significantly positive (1.7480) before the crisis while it becomes insignificant during the crisis. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to RAROA with the coefficient of 308.7365 during the crisis. Therefore, non-interest-income diversification still increases RAROA during the crisis.

(c) **Return on equity (ROE)** –Appendix 64 reports the statistical results.

Total period:

Two types of diversification have significant impacts on ROE. Although individual loan diversification (H3) has no significant impact on ROE, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to ROE with the coefficient of -0.0405. Therefore, loan diversification still reduces ROE. The coefficient on security diversification (H4) is -0.0062. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to ROE with the coefficient of 0.0279. Therefore, greater security diversification could still improve ROA with positive net impact of  $-0.0062 + 0.0279 * S4$  if S4 is greater than 0.2223. The results show that the sign of the impact of security diversification depends on the scale of security ratio. If the ratio is large enough, the impact turns from negative to positive.

The interaction of domestic geographic and loan diversifications (H2\*H3) has significant positive impact on ROE with the coefficient of 0.0557. In addition, the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant positive impact on ROE with the coefficient of 0.0279.

#### Sub-period analysis:

Although both the coefficients on domestic geographic diversification (H2) are insignificant before and during the crisis, the interaction of domestic geographic diversification and deposit ratio (H2\*S2) is significantly and negatively related to ROE with the coefficient of -0.0318 before the crisis. Therefore, domestic geographic diversification still reduces ROE before the crisis. Although both the coefficients on non-interest-income diversification (H5) are insignificant before and during the crisis, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to ROE with the coefficient of 4.2226 during the crisis. Therefore, non-interest-income diversification still increases ROE during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is significantly positive (0.0404) before the crisis while it becomes insignificant during the crisis.

(d) **Risk-adjusted return on equity (RAROE)** –Appendix 65 reports the statistical results.

#### Total period:

Only non-interest-income diversification (H5) has significant impact on RAROE. The impact is positive with the coefficient of 1.2280.

#### Sub-period analysis:

The coefficient on non-interest-income diversification (H5) is significantly positive (1.7325) before the crisis while it becomes insignificant during the crisis. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to RAROE with the coefficient of 309.3526 during the crisis. Therefore, non-interest-income diversification still increases RAROE during the crisis.

**Summary for accounting returns** - Table 77 reports the summary of significant effects of diversifications and interactions for total period. Table 78 reports the summary of significant effects of diversifications and interactions for the sub-periods.

## 6.2 Market returns

(a) **Stock return (SR)** –Appendix 66 reports the statistical results.

### Total period:

Only security diversification (H4) has significant impact on SR. The impact is positive with the coefficient of 0.0488.

### Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes positively significant (0.7304) during the crisis. The coefficient on loan diversification (H3) is insignificant before the crisis while it becomes positively significant (0.3682) during the crisis. The coefficient on security diversification (H4) is significantly positive (0.0596) before the crisis while it becomes insignificant during the crisis. The coefficient on non-interest-income diversification (H5) is insignificant before the crisis while it becomes positively significant (0.1883) during the crisis. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to SR with the coefficient of -10.4155 before the crisis. Therefore, non-interest-income diversification still reduces SR before the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) is insignificant before the crisis while it becomes negatively significant (-0.5275) during the crisis. In addition, the coefficient on the interaction of security and of-balance-sheet diversifications (H4\*H6) is significantly negative (-0.0690) before the crisis while it becomes insignificant during the crisis.



**Table 77: Summary of Significant Effects of Diversifications for All  
BHCs for Total Period**

		<u>Accounting Returns</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2	-			
Loan Div. (LD)	H3	+			
Security Div. (SD)	H4	-		-	
Non-interest-income Div. (NIID)	H5	+	+		+
Off-balance-sheet Div. (OBSD)	H6				
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3	-		-	
Security Div. (SD)	H4*S4	+	+	+	
Non-interest-income Div. (NIID)	H5*S5	-			
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
DGD * LD	H2*H3	+		+	
DGD * NIID	H2*H5	+		+	
SD * OBSD	H4*H6				
All Activities	H2*H3*H4*H5*H6				

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity

RAROE: risk-adjusted return on equity

**Table 78: Summary of Significant Effects of Diversifications for All BHCs**

**for Sub-periods**

		Accounting Returns							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable Abbreviation	ROA	RAROA	ROE	RAROE	ROA	RAROA	ROE	RAROE
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2	-					+		
Loan Div. (LD)	H3	+	+	+	+	+	+	+	+
Security Div. (SD)	H4	-					+		
Non-interest-income Div. (NIID)	H5	+	+		+	+			
Off-balance-sheet Div. (OBSD)	H6								
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2			-					
Loan Div. (LD)	H3*S3	-	-	-	-	-		-	-
Security Div. (SD)	H4*S4	+							
Non-interest-income Div. (NIID)	H5*S5	-					+	+	+
Off-balance-sheet Div. (OBSD)	H6*S6								
<b>Activity interaction</b>									
DGD * LD	H2*H3	+		+					
DGD * NIID	H2*H5	+							
SD * OBSD	H4*H6								
All Activities	H2*H3*H4*H5*H6								

ROA: return on asset      RAROA: risk-adjusted return on asset      ROE: return on equity

RAROE: risk-adjusted return on equity

(b) **Risk-adjusted stock return (RASR)** –Appendix 67 reports the statistical results.

Total period:

Two types of diversification have significant impacts on RASR. The impacts of loan diversification and security diversification are positive. The coefficient on loan diversification (H3) is 0.8153. The coefficient on security diversification (H4) is 0.2790.

The interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) has significant negative impact on RASR with the coefficient of -3.1407.

Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes positively significant (4.9388) during the crisis. The coefficient on loan diversification (H3) is insignificant before the crisis while it becomes positively significant (3.9194) during the crisis. The coefficient security diversification (H4) is significantly positive (0.3971) before the crisis while it becomes insignificant during the crisis. The coefficient on non-interest-income diversification (H5) is insignificant before the crisis while it becomes positively significant (0.9895) during the crisis. However, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and negatively related to RASR with the coefficient of -57.5344 before the crisis. Therefore, non-interest-income diversification still reduces RASR before the crisis. The coefficient on off-balance-sheet diversification (H6) is insignificant before the crisis while it becomes negatively significant (-0.8343) during the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes negatively significant (-4.6560) during the crisis. In addition, the coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is significantly negative (-2.5655) before the crisis while it becomes insignificant during the crisis.

**Summary for market returns** - Table 79 reports the summary of significant effects of diversifications and interactions for total period. Table 80 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 6.3 Credit risk

**Net charge-offs (NCO)** –Appendix 68 reports the statistical results.

#### Total period:

Two types of diversification have significant impacts on NCO. They are non-interest-income diversification and off-balance-sheet diversification. The impact of non-interest-income diversification is negative while the impact of off-balance-sheet diversification is positive. The coefficient on non-interest-income diversification (H5) is -0.0006. The coefficient on off-balance-sheet diversification (H6) is 0.0006.

The interaction of security and off-balance-sheet diversifications (H4\*H6) has significant negative impact on NCO with the coefficient of -0.0014.

#### Sub-period analysis:

The coefficient on loan diversification (H3) is insignificant before the crisis while it becomes negatively significant (-0.0048) during the crisis. However, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and positively related to NCO with the coefficient of 0.0058 during the crisis. Therefore, greater loan diversification could still increase NCO with positive net impact of  $-0.0048 + 0.0058 * S3$  if S3 is greater than 0.8276. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio during the crisis. If the ratio is large enough, the impact turns from negative to positive. The coefficient on non-interest-income diversification

**Table 79: Summary of Significant Effects of Diversifications**  
**for All BHCs for Total Period**

		<u>Market Returns</u>	
	Variable Abbreviation	SR	RASR
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		+
Security Div. (SD)	H4	+	+
Non-interest-income Div. (NIID)	H5		
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		
DGD * NIID	H2*H5		
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		-

SR: stock return      RASR: risk-adjusted stock return

**Table 80: Summary of Significant Effects of Diversifications for All BHCs**  
for Sub-periods

		Market Returns			
		<u>Before The Crisis</u>		<u>During The Crisis</u>	
	Variable Abbreviation	SR	RASR	SR	RASR
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2			+	+
Loan Div. (LD)	H3			+	+
Security Div. (SD)	H4	+	+		
Non-interest-income Div. (NIID)	H5			+	+
Off-balance-sheet Div. (OBSD)	H6	+			-
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3				-
Security Div. (SD)	H4*S4				
Non-interest-income Div. (NIID)	H5*S5	-	-		
Off-balance-sheet Div. (OBSD)	H6*S6				
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5			-	-
SD * OBSD	H4*H6	-			
All Activities	H2*H3*H4*H5*H6		-		

SR: stock return      RASR: risk-adjusted stock return

(H5) is significantly negative (-0.0006) before the crisis while it becomes insignificant during the crisis. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to NCO with the coefficient of -0.4803 during the crisis. Therefore, security diversification still reduces NCO during the crisis. The coefficient on off-balance-sheet diversification (H6) is significantly positive (0.0005) before the crisis while it becomes insignificant during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is significantly positive (0.0026) before the crisis while it becomes insignificant during the crisis. The coefficient on the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) is insignificant before the crisis while it becomes positively significant (0.0095) during the crisis. The coefficient on the interaction of security and off-balance-sheet diversifications (H4\*H6) is significantly negative (-0.0010) before the crisis while it becomes insignificant during the crisis.

**Summary for credit risk** - Table 81 reports the summary of significant effects of diversifications and interactions for total period. Table 82 reports the summary of significant effects of diversifications and interactions for the sub-periods.

#### 6.4 Market risk

(a) **Maturity gap (MG)** –Appendix 69 reports the statistical results.

##### Total period:

Two types of diversification have significant impacts on MG. They are non-interest-income diversification and off-balance-sheet diversification. Although individual non-interest-income diversification (H5) has no significant impact on MG, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and negatively related to MG with the coefficient of -1.5069.

**Table 81: Summary of Significant Effects of Diversifications  
for All BHCs for Total Period**

		<u>Credit Risk</u>
	Variable Abbreviation	NCO
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	-
Off-balance-sheet Div. (OBSD)	H6	+
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	+
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	-
All Activities	H2*H3*H4*H5*H6	

NCO: net charge-offs



**Table 82: Summary of Significant Effects of Diversifications**  
**for All BHCs for Sub-periods**

		Credit Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	NCO	NCO
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		
Loan Div. (LD)	H3		-
Security Div. (SD)	H4		
Non-interest-income Div. (NIID)	H5	-	
Off-balance-sheet Div. (OBSD)	H6	+	
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3		+
Security Div. (SD)	H4*S4		
Non-interest-income Div. (NIID)	H5*S5		-
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3	+	
DGD * NIID	H2*H5		+
SD * OBSD	H4*H6	-	
All Activities	H2*H3*H4*H5*H6		

NCO: net charge-offs

Therefore, non-interest-income diversification still reduces MG. The coefficient on off-balance-sheet diversification (H6) is 0.0579.

The interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) has significant negative impact on MG with the coefficient of -0.0730. The interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) has significant negative impact on MG with the coefficient of -0.4227.

#### Sub-period analysis:

Although both the coefficients on security diversification (H4) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and negatively related to MG with the coefficient of -0.1650 before the crisis. Therefore, security diversification still reduces MG before the crisis. Although both the coefficients on non-interest-income diversification (H5) are insignificant before and during the crisis, the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) is significantly and negatively related to MG with the coefficient of -1.3185 before the crisis. Therefore, non-interest-income diversification still reduces MG before the crisis. The coefficient on off-balance-sheet diversification (H6) is significantly positive (0.0500) before the crisis while it becomes insignificant during the crisis. However, the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) is significantly and negatively related to MG with the coefficient of -0.0473 during the crisis. Therefore, off-balance-sheet diversification still reduces MG during the crisis.

. The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is insignificant before the crisis while it becomes positively significant (0.5756) during the crisis. The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is significantly positive (0.1491) before the

crisis while it becomes insignificant during the crisis. The coefficient on the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) is insignificant before the crisis while it becomes negatively significant (-0.1816) during the crisis. The coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is significantly negative (-0.6580) before the crisis while it becomes insignificant during the crisis.

(b) **Derivatives loss (DL)** –Appendix 70 reports the statistical results.

Total period:

Only off-balance-sheet diversification ( $H6$ ) has significant impact on DL. The impact is positive with the coefficient of 0.00004.

The interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) has significant negative impact on DL with the coefficient of -0.0003.

Sub-period analysis:

The coefficient on domestic geographic diversification ( $H2$ ) is significantly negative (-0.0001) before the crisis while it is significantly positive (0.0001) during the crisis. Although both the coefficients on security diversification ( $H4$ ) are insignificant before and during the crisis, the interaction of security diversification and security ratio ( $H4*S4$ ) is significantly and positively related to DL with the coefficient of 0.0001 before the crisis. Therefore, security diversification still increases DL before the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) is insignificant before the crisis while it becomes positively significant (0.0001) during the crisis. The coefficient on the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) is insignificant before the crisis while it becomes positively significant (0.0003) during the crisis. The coefficient on the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) is insignificant before the crisis while it becomes negatively significant (-0.0010) during the crisis.

(c) **Market beta (MB)** –Appendix 71 reports the statistical results.

Total period:

Two types of diversification have significant impacts on MB. The impacts of non-interest-income diversification and off-balance-sheet diversification are negative. The coefficient on non-interest-income diversification (H5) is -0.1249. Although individual off-balance-sheet diversification (H6) has no significant impact on MB, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to MB with the coefficient of -0.0217. Therefore, off-balance-sheet diversification still reduces MB.

The interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) has significant negative impact on MB with the coefficient of -1.6055.

Sub-period analysis:

The coefficient on security diversification (H4) is significantly positive (0.2180) before the crisis while it becomes insignificant during the crisis. The coefficient on non-interest-income diversification (H5) is insignificant before the crisis while it becomes negatively significant (-0.5022) during the crisis. Although both the coefficients on off-balance-sheet diversification (H6) are insignificant before and during the crisis, the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) is significantly and negatively related to MB with the coefficient of -0.0234 before the crisis. Therefore, off-balance-sheet diversification still reduces MB before the crisis.

The coefficient on the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) is insignificant before the crisis while it becomes positively significant (1.5594) during the crisis.

(d) **Interest rate beta (IRB)** –Appendix 72 reports the statistical results.

#### Total period:

Two types of diversification have significant impacts on IRB. The impacts of security diversification and off-balance diversification are positive. Although individual security diversification (H4) has no significant impact on IRB, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to IRB with the coefficient of 0.3686. Therefore, security diversification still increases IRB. The coefficient on off-balance-sheet diversification (H6) is 0.0718.

The interaction of domestic geographic and non-interest-income diversifications (H2\*H5) has significant positive impact on IRB with the coefficient of 0.1841. The interaction of security and off-balance-sheet diversifications (H4\*H6) has significant negative impact on IRB with the coefficient of -0.1279.

#### Sub-period analysis:

There are no significant differences in the effects of diversifications and interactions on IRB between before and during crisis.

**Summary for market risk** - Table 83 reports the summary of significant effects of diversifications and interactions for total period. Table 84 reports the summary of significant effects of diversifications and interactions for the sub-periods.

### 6.5 Default risk

**Distance to default (Z-score)** –Appendix 73 reports the statistical results.

#### Total period:

Two types of diversification have significant impacts on Z. The impacts of security diversification and non-interest-income diversification are positive. Although individual security diversification (H4) has no significant impact on Z, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to Z with the coefficient of 183.37. Therefore, security diversification still increases Z. The

**Table 83: Summary of Significant Effects of Diversifications for All BHCs  
for Total Period**

		<u>Market Risk</u>			
	Variable Abbreviation	MG	DL	MB	IRB
<b>Activity diversification</b>					
Domestic Geographic Div. (DGD)	H2				
Loan Div. (LD)	H3				
Security Div. (SD)	H4				
Non-interest-income Div. (NIID)	H5			-	
Off-balance-sheet Div. (OBSD)	H6	+	+		+
<b>Scale interaction</b>					
Domestic Geographic Div. (DGD)	H2*S2				
Loan Div. (LD)	H3*S3				
Security Div. (SD)	H4*S4				+
Non-interest-income Div. (NIID)	H5*S5	-			
Off-balance-sheet Div. (OBSD)	H6*S6	-	+	-	
<b>Activity interaction</b>					
DGD * LD	H2*H3				
DGD * NIID	H2*H5				+
SD * OBSD	H4*H6	-			-
All Activities	H2*H3*H4*H5*H6	-	-	-	

MG: maturity gap    DL: derivatives loss    MB: market beta    IRB: interest rate beta

**Table 84: Summary of Significant Effects of Diversifications for All BHCs**

**for Sub-periods**

		Market Risk							
		<u>Before The Crisis</u>				<u>During The Crisis</u>			
	Variable Abbreviation	MG	DL	MB	IRB	MG	DL	MB	IRB
<b>Activity diversification</b>									
Domestic Geographic Div. (DGD)	H2		-				+		
Loan Div. (LD)	H3								
Security Div. (SD)	H4			+					
Non-interest-income Div. (NIID)	H5							-	
Off-balance-sheet Div. (OBSD)	H6	+	+		+		+		+
<b>Scale interaction</b>									
Domestic Geographic Div. (DGD)	H2*S2		+				-		
Loan Div. (LD)	H3*S3								
Security Div. (SD)	H4*S4	-	+		+				+
Non-interest-income Div. (NIID)	H5*S5	-							
Off-balance-sheet Div. (OBSD)	H6*S6	-	+	-		-			
<b>Activity interaction</b>									
DGD * LD	H2*H3					+	+		
DGD * NIID	H2*H5	+					+	+	
SD * OBSD	H4*H6				-	-			-
All Activities	H2*H3*H4*H5*H6	-		-			-	-	

MG: maturity gap      DL: derivatives loss      MB: market beta      IRB: interest rate beta

coefficient on non-interest-income diversification (H5) is 26.27.

Sub-period analysis:

The coefficient on domestic geographic diversification (H2) is insignificant before the crisis while it becomes positively significant (528.53) during the crisis. The coefficient on loan diversification (H3) is significantly positive (260.66) before the crisis while it becomes insignificant during the crisis. Moreover, the interaction of loan diversification and loan ratio (H3\*S3) is significantly and negatively related to Z with the coefficient of -506.07 before the crisis. Therefore, greater loan diversification could still reduce Z with negative net impact of  $260.66 - 506.07 * S3$  if S3 is greater than 0.5151. The results show that the sign of the impact of loan diversification depends on the scale of loan ratio before the crisis. If the ratio is large enough, the impact turns from positive to negative. The coefficient on security diversification (H4) is insignificant before the crisis while it becomes positively significant (168.02) during the crisis. However, the interaction of security diversification and security ratio (H4\*S4) is significantly and positively related to Z with the coefficient of 193.60 before the crisis. Therefore, security diversification still increases Z before the crisis. The coefficient on non-interest-income diversification (H5) is significantly positive (42.92) before the crisis while it becomes insignificant during the crisis. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) is significantly and positively related to Z with the coefficient of 7672.01 during the crisis. Therefore, non-interest-income diversification still increases Z during the crisis.

The coefficient on the interaction of domestic geographic and loan diversifications (H2\*H3) is insignificant before the crisis while it becomes negatively significant (-761.11) during the crisis.

**Summary for default risk** - Table 85 reports the summary of significant effects of diversifications and interactions for total period. Table 86 reports the summary of



significant effects of diversifications and interactions for the sub-periods.

## **SUMMARY OF DIVERSIFICATION AND INTERACTION EFFECTS FOR ALL BHCs**

a. Total period: Table 87 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Loan diversification (H3), non-interest-income diversification (H5), the interaction of security diversification and security ratio (H4\*S4), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2), security diversification (H4), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Loan diversification (H3) and security diversification (H4) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Non-interest-income diversification (H5) and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6) and the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**Table 85: Summary of Significant Effects of Diversifications  
for All BHCs for Total Period**

		<u>Default Risk</u>
	Variable Abbreviation	Z
<b>Activity diversification</b>		
Domestic Geographic Div. (DGD)	H2	
Loan Div. (LD)	H3	
Security Div. (SD)	H4	
Non-interest-income Div. (NIID)	H5	+
Off-balance-sheet Div. (OBSD)	H6	
<b>Scale interaction</b>		
Domestic Geographic Div. (DGD)	H2*S2	
Loan Div. (LD)	H3*S3	
Security Div. (SD)	H4*S4	+
Non-interest-income Div. (NIID)	H5*S5	
Off-balance-sheet Div. (OBSD)	H6*S6	
<b>Activity interaction</b>		
DGD * LD	H2*H3	
DGD * NIID	H2*H5	
SD * OBSD	H4*H6	
All Activities	H2*H3*H4*H5*H6	

Z: distance to default

**Table 86: Summary of Significant Effects of Diversifications**  
**for All BHCs for Sub-periods**

		Default Risk	
		<u>Before The Crisis</u>	<u>During The Crisis</u>
	Variable Abbreviation	Z	Z
<b>Activity diversification</b>			
Domestic Geographic Div. (DGD)	H2		+
Loan Div. (LD)	H3	+	
Security Div. (SD)	H4		+
Non-interest-income Div. (NIID)	H5	+	
Off-balance-sheet Div. (OBSD)	H6		
<b>Scale interaction</b>			
Domestic Geographic Div. (DGD)	H2*S2		
Loan Div. (LD)	H3*S3	-	
Security Div. (SD)	H4*S4	+	
Non-interest-income Div. (NIID)	H5*S5		+
Off-balance-sheet Div. (OBSD)	H6*S6		
<b>Activity interaction</b>			
DGD * LD	H2*H3		-
DGD * NIID	H2*H5		
SD * OBSD	H4*H6		
All Activities	H2*H3*H4*H5*H6		

Z: distance to default

**Table 87: Number and Percentage of Significant Effects of Diversifications and Interactions for All BHCs for Total Period**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Loan Div. (LD)	H3	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	2	0	2
Security Div. (SD)	H4	0	2	2	2	0	2	0	0	0	0	0	0	0	0	0	2	2	4
Non-interest-income Div. (NIID)	H5	3	0	3	0	0	0	1	0	1	1	0	1	1	0	1	6	0	6
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	0	0	0	1	1	0	3	3	0	0	0	0	4	4
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan Div. (LD)	H3*S3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Security Div. (SD)	H4*S4	3	0	3	0	0	0	0	0	0	0	1	1	1	0	1	4	1	5
Non-interest-income Div. (NIID)	H5*S5	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	2
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	1	1	2	1	3	0	0	0	2	2	4
<b>Activity interaction</b>																			
DGD * LD	H2*H3	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
DGD * NIID	H2*H5	2	0	2	0	0	0	0	0	0	0	1	1	0	0	0	2	1	3
SD * OBSD	H4*H6	0	0	0	0	0	0	1	0	1	2	0	2	0	0	0	3	0	3
All Activities	H2*H3*H4*H5*H6	0	0	0	0	1	1	0	0	0	3	0	3	0	0	0	3	1	4

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	0	25	25	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	8	8	0.00
Loan Div. (LD)	H3	25	0	25	X	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
Security Div. (SD)	H4	0	50	50	0.00	100	0	100	x	0	0	0	.	0	0	0	.	0	0	0	.	17	17	33	1.00
Non-interest-income Div. (NIID)	H5	75	0	75	X	0	0	0	.	100	0	100	x	25	0	25	x	100	0	100	x	50	0	50	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	0	0	.	0	100	100	0.00	0	75	75	0.00	0	0	0	.	0	33	33	0.00
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.
Loan Div. (LD)	H3*S3	0	50	50	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	0	17	17	0.00
Security Div. (SD)	H4*S4	75	0	75	X	0	0	0	.	0	0	0	.	0	25	25	0.00	100	0	100	x	33	8	42	4.13
Non-interest-income Div. (NIID)	H5*S5	0	25	25	0.00	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	8	17	1.00
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	100	100	0.00	50	25	75	2.00	0	0	0	.	17	17	33	1.00
<b>Activity interaction</b>																									
DGD * LD	H2*H3	50	0	50	x	0	0	0	.	0	0	0	.	0	0	0	.	0	0	0	.	17	0	17	X
DGD * NIID	H2*H5	50	0	50	x	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	17	8	25	2.13
SD * OBSD	H4*H6	0	0	0	.	0	0	0	.	100	0	100	x	50	0	50	x	0	0	0	.	25	0	25	X
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	50	50	0.00	0	0	0	.	75	0	75	x	0	0	0	.	25	8	33	3.13

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

**For market risk** - Non-interest-income diversification (H5), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of security and off-balance-sheet diversifications (H4\*H6), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6) and the interaction of security diversification and security ratio (H4\*S4) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Non-interest-income diversification (H5) and the interaction of security diversification and security ratio (H4\*S4) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts.

b. Before the crisis: Table 88 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Loan diversification (H3), non-interest-income diversification (H5), the interaction of security diversification and security ratio (H4\*S4), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2), security diversification (H4), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Security diversification (H4) and off-balance-sheet

diversification (H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of security and off-balance-sheet diversifications (H4\*H6), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Non-interest-income diversification (H5) and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6) and the interaction of domestic geographic and loan diversifications (H2\*H3) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Domestic geographic diversification (H2), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of security and off-balance-sheet diversifications (H4\*H6), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification (H4), off-balance-sheet diversification (H6), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of security diversification and security ratio (H4\*S4), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**Table 88: Number and Percentage of Significant Effects of Diversifications and Interactions for All BHCs Before The Crisis**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	2
Loan Div. (LD)	H3	4	0	4	0	0	0	0	0	0	0	0	0	1	0	1	5	0	5
Security Div. (SD)	H4	0	1	1	2	0	2	0	0	0	0	1	1	0	0	0	2	2	4
Non-interest-income Div. (NIID)	H5	3	0	3	0	0	0	1	0	1	0	0	0	1	0	1	5	0	5
Off-balance-sheet Div. (OBSD)	H6	0	0	0	1	0	1	0	1	1	0	3	3	0	0	0	1	4	5
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2
Loan Div. (LD)	H3*S3	0	4	4	0	0	0	0	0	0	0	0	0	0	1	1	0	5	5
Security Div. (SD)	H4*S4	1	0	1	0	0	0	0	0	0	1	2	3	1	0	1	3	2	5
Non-interest-income Div. (NIID)	H5*S5	0	1	1	0	2	2	0	0	0	1	0	1	0	0	0	1	3	4
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	2	1	3
<b>Activity interaction</b>																			
DGD * LD	H2*H3	2	0	2	0	0	0	0	1	1	0	0	0	0	0	0	2	1	3
DGD * NIID	H2*H5	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	2
SD * OBSD	H4*H6	0	0	0	0	1	1	1	0	1	1	0	1	0	0	0	2	1	3
All Activities	H2*H3*H4*H5*H6	0	0	0	0	1	1	1	0	0	0	2	0	2	0	0	2	1	3

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	0	25	25	0.00	0	0	0	.	0	0	0	.	25	0	25	x	0	0	0	.	8	8	17	1.00
Loan Div. (LD)	H3	100	0	100	X	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	x	42	0	42	X
Security Div. (SD)	H4	0	25	25	0.00	100	0	100	x	0	0	0	.	0	25	25	0.00	0	0	0	.	17	17	33	1.00
Non-interest-income Div. (NIID)	H5	75	0	75	X	0	0	0	.	100	0	100	x	0	0	0	.	100	0	100	x	42	0	42	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	50	0	50	x	0	100	100	0.00	0	75	75	0.00	0	0	0	.	8	33	42	0.24
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	25	25	0.00	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	17	17	0.00
Loan Div. (LD)	H3*S3	0	100	100	0.00	0	0	0	.	0	0	0	.	0	0	0	.	0	100	100	0.00	0	42	42	0.00
Security Div. (SD)	H4*S4	25	0	25	X	0	0	0	.	0	0	0	.	25	50	75	0.50	100	0	100	x	25	17	42	1.47
Non-interest-income Div. (NIID)	H5*S5	0	25	25	0.00	0	100	100	0.00	0	0	0	.	25	0	25	X	0	0	0	.	8	25	33	0.32
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	0	0	.	50	25	75	2.00	0	0	0	.	17	8	25	2.13
<b>Activity interaction</b>																									
DGD * LD	H2*H3	50	0	50	x	0	0	0	.	0	100	100	0.00	0	0	0	.	0	0	0	.	17	8	25	2.13
DGD * NIID	H2*H5	25	0	25	x	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	8	8	17	1.00
SD * OBSD	H4*H6	0	0	0	.	0	50	50	0.00	100	0	100	x	25	0	25	x	0	0	0	.	17	8	25	2.13
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	50	50	0.00	0	0	0	.	50	0	50	x	0	0	0	.	17	8	25	2.13

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity; "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

**For default risk** - Loan diversification (H3), non-interest-income diversification (H5), and the interaction of security diversification and security ratio (H4\*S4) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

c. During the crisis: Table 89 reports the number and percentage of significant effects of diversifications and interactions.

**For accounting returns** - Domestic geographic diversification (H2), loan diversification (H3), security diversification (H4), and non-interest-income diversification (H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3) and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market returns** - Domestic geographic diversification (H2), loan diversification (H3), and non-interest-income diversification (H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification (H6), the interaction of loan diversification and loan ratio (H3\*S3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For credit risk** - Loan diversification (H3) and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3) and the



interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For market risk** - Non-interest-income diversification ( $H5$ ), the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification ( $H2$ ), off-balance-sheet diversification ( $H6$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For default risk** - Domestic geographic diversification ( $H2$ ), security diversification ( $H4$ ), and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) hurt BHCs with their (+/-) ratio less than one, indicating that unfavorable impacts dominate favorable impacts.

## SUMMARY OF IMPACT SWITCH OF DIVERSIFICATION

Table 90 reports a summary of how the impact of diversification may change or switch signs for the total sample period. It indicates the signs of the diversification impacts (favorable or unfavorable) and the switch points regarding the scale of their associated activities. The results show that the impact of some forms of diversification

**Table 89: Number and Percentage of Significant Effects of Diversifications and Interactions for All BHCs During The Crisis**

		(n=4)			(n=2)			(n=1)			(n=4)			(n=1)			(n=12)		
(Number)	Variable Abbreviation	Accounting Returns			Market Returns			Credit Risk			Market Risk			Default Risk			All Performances		
		+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total	+	-	Total
<b>Activity diversification</b>																			
Domestic Geographic Div. (DGD)	H2	1	0	1	2	0	2	0	0	0	0	1	1	1	0	1	4	1	5
Loan Div. (LD)	H3	4	0	4	2	0	2	1	0	1	0	0	0	0	0	0	7	0	7
Security Div. (SD)	H4	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	2	0	2
Non-interest-income Div. (NIID)	H5	1	0	1	2	0	2	0	0	0	1	0	1	0	0	0	4	0	4
Off-balance-sheet Div. (OBSD)	H6	0	0	0	0	1	1	0	0	0	0	2	2	0	0	0	0	3	3
<b>Scale interaction</b>																			
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
Loan Div. (LD)	H3*S3	0	3	3	0	1	1	0	1	1	0	0	0	0	0	0	0	5	5
Security Div. (SD)	H4*S4	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Non-interest-income Div. (NIID)	H5*S5	0	3	3	0	0	0	1	0	1	0	0	0	1	0	1	2	3	5
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
<b>Activity interaction</b>																			
DGD * LD	H2*H3	0	0	0	0	0	0	0	0	0	0	2	2	0	1	1	0	3	3
DGD * NIID	H2*H5	0	0	0	0	2	2	0	1	1	0	2	2	0	0	0	0	5	5
SD * OBS	H4*H6	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	2	0	2
All Activities	H2*H3*H4*H5*H6	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	2	0	2

		Accounting Returns				Market Returns				Credit Risk				Market Risk				Default Risk				All Performances			
( % )	Variable Abbreviation	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
Domestic Geographic Div. (DGD)	H2	25	0	25	x	100	0	100	x	0	0	0	.	0	25	25	0.00	100	0	100	x	33	8	42	4.13
Loan Div. (LD)	H3	100	0	100	x	100	0	100	x	100	0	100	x	0	0	0	.	0	0	0	.	58	0	58	X
Security Div. (SD)	H4	25	0	25	x	0	0	0	.	0	0	0	.	0	0	0	.	100	0	100	x	17	0	17	X
Non-interest-income Div. (NIID)	H5	25	0	25	x	100	0	100	x	0	0	0	.	25	0	25	X	0	0	0	.	33	0	33	X
Off-balance-sheet Div. (OBSD)	H6	0	0	0	.	0	50	50	0.00	0	0	0	.	0	50	50	0.00	0	0	0	.	0	25	25	0.00
<b>Scale interaction</b>																									
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	0	8	X
Loan Div. (LD)	H3*S3	0	75	75	0.00	0	50	50	0.00	0	100	100	0.00	0	0	0	.	0	0	0	.	0	42	42	0.00
Security Div. (SD)	H4*S4	0	0	0	.	0	0	0	.	0	0	0	.	0	25	25	0.00	0	0	0	.	0	8	8	0.00
Non-interest-income Div. (NIID)	H5*S5	0	75	75	0.00	0	0	0	.	100	0	100	X	0	0	0	.	100	0	100	x	17	25	42	0.68
Off-balance-sheet Div. (OBSD)	H6*S6	0	0	0	.	0	0	0	.	0	0	0	.	25	0	25	X	0	0	0	.	8	0	8	X
<b>Activity interaction</b>																									
DGD * LD	H2*H3	0	0	0	.	0	0	0	.	0	0	0	.	0	50	50	0.00	0	100	100	0.00	0	25	25	0.00
DGD * NIID	H2*H5	0	0	0	.	0	100	100	0.00	0	100	100	0.00	0	50	50	0.00	0	0	0	.	0	42	42	0.00
SD * OBS	H4*H6	0	0	0	.	0	0	0	.	0	0	0	.	50	0	50	x	0	0	0	.	17	0	17	x
All Activities	H2*H3*H4*H5*H6	0	0	0	.	0	0	0	.	0	0	0	.	50	0	50	x	0	0	0	.	17	0	17	x

"n" indicates the number of performance measures; "+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable; "x" indicates infinity. "." indicates an unavailable item.

"Percentage" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs performance measures.

"Total" indicates the total number or percentage of individual diversification or interaction which have significant impacts on BHCs performance measures; +/- indicates the ratio of "+" to "-".

depends on the relative magnitude or the scale of their associated activities. That is, when the scale of the diversified activity is large enough, the diversification impact changes its direction.

For example, for small BHCs, when the scale of loan ratio (S3) is not large, loan diversification (H3) has an unfavorable impact on maturity gap (MG). But when the scale ratio reaches 0.6888, the net impact turns favorable. It is instructive to observe that the average scale value is 0.6597, which is slightly below the switch point. The implication is that roughly half of the small BHCs experience an unfavorable impact from loan diversification while the other half experiences a favorable impact. When the security scale ratio (S4) is small, security diversification (H4) has unfavorable impacts on both ROA and ROE. When the non-interest-income scale ratio (S5) is below the switch point, non-interest-income diversification (H5) has favorable impacts on both ROA and ROE, and an unfavorable impact on both stock returns (SR) and risk-adjusted stock returns (RASR). When the off-balance-sheet scale ratio (S6) is not large, off-balance-sheet diversification (H6) has a favorable impact on derivatives losses (DL), and an unfavorable impact on net charge-offs (NCO) and market beta (MB).

For larger community BHCs, when the loan scale ratio (S3) is below the switch point, loan diversification (H3) has favorable impact on ROA. When the security scale ratio (S4) is small, security diversification (H4) has an unfavorable impact on ROA. When the off-balance-sheet scale ratio (S6) is below the switch point, off-balance-sheet diversification (H6) has a favorable impact on derivatives losses (DL).

For regional BHCs, when the loan scale ratio (S3) is not large, loan diversification (H3) has favorable impacts on risk-adjusted ROA (RAROA), market beta (MB) and distance to default (Z), and an unfavorable impact on maturity gap (MG). When the security scale ratio (S4) is below the switch point, security diversification (H4) has a

**Table 90: Summary of Impact Switch of Diversification for Total Period**

<b>Small BHCs</b>	ROA	ROA	ROE	ROE	SR	RASR	NCO	MG	DL	MB
Significant impact	H4 (-)	H5 (+)	H4 (-)	H5 (+)	H5 (-)	H5 (-)	H6 (-)	H3 (-)	H6 (+)	H6 (-)
Switch point	0.1887	0.0022	0.1995	0.0022	0.0016	0.0033	0.6522	0.6888	0.2000	0.3798
Mean of scale	0.1863	0.0023	0.1863	0.0023	0.0023	0.0023	0.1513	0.6597	0.1513	0.1513
<b>Larger Community BHCs</b>	ROA	ROA	DL							
Significant impact	H3 (+)	H4 (-)	H6 (+)							
Switch point	0.4126	0.4667	0.2500							
Mean of scale	0.6707	0.1902	0.2230							
<b>Regional BHCs</b>	RAROA	RAROA	RAROE	RASR	NCO	MG	MB	Z	Z	
Significant impact	H3 (+)	H4 (-)	H4 (-)	H5 (+)	H4 (+)	H3 (-)	H3 (+)	H3 (+)	H4 (-)	
Switch point	0.7972	0.1668	0.1487	0.0133	0.3056	0.8607	0.7620	0.7486	0.1445	
Mean of scale	0.6763	0.1572	0.1572	0.0045	0.1572	0.6763	0.6763	0.6763	0.1572	
<b>All BHCs</b>	ROA	ROA	ROA	ROE						
Significant impact	H3 (+)	H4 (-)	H5 (+)	H4 (-)						
Switch point	0.6275	0.3125	0.0063	0.2223						
Mean of scale	0.6634	0.1871	0.0031	0.1871						

"+" indicates favorable impact; "-" indicates unfavorable impact.

H3: loan diversification; H4: security diversification; H5: non-interest-income diversification; H6: off-balance-sheet diversification.

Significant impact indicates the diversification which has significant positive/negative impact at 10% significance level on performance measures

Switch point indicates the scale of activity/total asset ratio at which diversification changes its direction of impact

Mean of scale indicates the mean of activity/total asset ratio

ROA: return on asset; RAROA: risk-adjusted ROA; ROE: return on equity; RAROE: risk-adjusted ROE; SR: stock return; RASR: risk-adjusted SR;

NCO: net charge-offs; MG: maturity gap; DL: derivatives losses; MB: market beta; IRB: interest rate beta; Z: distance to default

favorable impact on net charge-offs (NCO) and unfavorable impacts on risk-adjusted ROA (RAROA), risk-adjusted ROE (RAROE) and distance to default (Z). When the non-interest-income scale ratio (S5) is small, non-interest-income diversification (H5) has a favorable impact on risk-adjusted stock return (RASR).

For all BHCs, when the loan scale ratio (S3) is below the switch point, loan diversification (H3) has a favorable impact on ROA. When the security scale ratio (S4) is small, the security diversification (H4) has unfavorable impacts on ROA and ROE. When the non-interest-income scale ratio (S5) is not large, non-interest-income diversification (H5) has a favorable impact on ROA.

In general, among the various forms of diversification where the net impacts switch with scale, loan diversification switches from favorable to unfavorable five times out of seven. The results suggest that BHCs might tend to make increasingly risky loans when the size of their loan portfolios expands beyond a critical level. Moreover, agency problems might also become uncontrollable. On the other hand, security diversification tends to switch from unfavorable to favorable eight out of nine times. Thus, the results indicate that with larger portfolios of securities, BHCs are more likely to reduce portfolio risk and increase their returns with a wide selection of diversified securities.

## **SUMMARY OF INDIVIDUAL DIVERSIFICATION AND INTERACTION EFFECTS ON BHCs' INTEGRAL PERFORMANCE**

a. Total period: Table 91 reports the summary of percentage of significant impacts of diversifications and interactions on BHCs' integral performance.

**For small BHCs** - Non-interest-income diversification (H5), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of security diversification and security ratio (H4\*S4), the interaction of domestic geographic and non-interest-income diversifications (H2\*H5), the interaction of security and off-balance-sheet

diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, loan diversification ( $H3$ ), security diversification ( $H4$ ), off-balance-sheet diversification ( $H6$ ), and the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For larger community BHCs** - Loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification ( $H2$ ), security diversification ( $H4$ ), off-balance-sheet diversification ( $H6$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), , and the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For regional BHCs** - Domestic geographic diversification ( $H2$ ), loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ),

the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For money center BHCs** - Domestic geographic diversification ( $H2$ ), loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), off-balance-sheet diversification ( $H6$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For international BHCs** - Domestic geographic diversification ( $H2$ ), off-balance-sheet diversification ( $H6$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of international geographic and loan diversifications ( $H1*H3$ ), the interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ), and the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification ( $H1$ ), loan diversification ( $H3$ ), security

**Table 91: Summary of Percentage of Significant Impacts of Diversifications and Interactions on BHCs' Integral Performance for Total Period**

( % )	Variable Abbreviation	<u>Small</u>				<u>Community</u>				<u>Regional</u>				<u>Money Center</u>				<u>International</u>				<u>All BHCs</u>			
		+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
<b>Activity diversification</b>																									
International Geographic Div. (IGD)	H1																	0	50	50	0.00				
Domestic Geographic Div. (DGD)	H2	0	0	0	.	8	17	25	0.47	42	17	58	2.47	15	0	15	x	8	0	8	X	0	8	8	0.00
Loan Div. (LD)	H3	0	8	8	0.00	17	0	17	X	25	8	33	3.13	8	0	8	x	8	58	67	0.14	17	0	17	X
Security Div. (SD)	H4	8	33	42	0.24	0	17	17	0.00	8	25	33	0.32	8	8	15	1.00	0	8	8	0.00	17	17	33	1.00
Non-interest-income Div. (NIID)	H5	25	17	42	1.47	50	0	50	X	17	0	17	X	15	8	23	1.88	0	33	33	0.00	50	0	50	X
Off-balance-sheet Div. (OBSD)	H6	8	17	25	0.47	8	17	25	0.47	0	0	0	.	23	0	23	X	17	0	17	X	0	33	33	0.00
<b>Scale interaction</b>																									
International Geographic Div. (IGD)	H1*S1																	0	25	25	0.00				
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	17	0	17	X	8	8	17	1.00	15	15	31	1.00	0	17	17	0.00	0	0	0	.
Loan Div. (LD)	H3*S3	8	0	8	X	8	8	17	1.00	8	25	33	0.32	0	8	8	0.00	8	42	50	0.19	0	17	17	0.00
Security Div. (SD)	H4*S4	33	0	33	X	8	17	25	0.47	42	8	50	5.25	15	0	15	X	17	0	17	X	33	8	42	4.13
Non-interest-income Div. (NIID)	H5*S5	17	17	33	1.00	17	0	17	X	0	25	25	0.00	8	0	8	X	17	8	25	2.13	8	8	17	1.00
Off-balance-sheet Div. (OBSD)	H6*S6	17	17	33	1.00	8	17	25	0.47	25	0	25	X	8	15	23	0.53	0	8	8	0.00	17	17	33	1.00
<b>Activity interaction</b>																									
IGD*LD	H1*H3																	67	0	67	X				
IGD*NIID	H1*H5																	33	0	33	X				
DGD * LD	H2*H3	0	8	8	0.00	0	8	8	0.00	8	17	25	0.47	0	8	8	0.00	0	8	8	0.00	17	0	17	X
DGD * NIID	H2*H5	8	0	8	X	17	17	33	1.00	17	25	42	0.68	0	8	8	0.00	0	50	50	0.00	17	8	25	2.13
SD * OBSD	H4*H6	17	8	25	2.13	17	0	17	x	0	0	0	.	0	8	8	0.00	8	8	17	1.00	25	0	25	X
All Activities	H2*H3*H4*H5*H6	8	0	8	X	8	0	8	x	0	8	8	0.00	0	8	8	0.00	25	0	25	x	25	8	33	3.13

"+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable, "x" indicates infinity. "." indicates an unavailable item.

"%" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs' integral performance

"Total" indicates the percentage of performance measures on which individual diversification or interaction have significant impacts; +/- indicates the ratio of "+" to "-".



diversification (H4), non-interest-income diversification (H5), the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For all BHCs** - Loan diversification (H3), non-interest-income diversification (H5), the interaction of security diversification and security ratio (H4\*S4), the interaction of domestic geographic and loan diversifications (H2\*H3), the interaction of domestic geographic and non-interest-income diversifications (H2\*H5), the interaction of security and off-balance-sheet diversifications (H4\*H6), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2), off-balance-sheet diversification (H6), and the interaction of loan diversification and loan ratio (H3\*S3) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

b. Before the crisis: Table 92 reports the summary of percentage of significant impacts of diversifications and interactions on BHCs' integral performance.

**For small BHCs** - Non-interest-income diversification (H5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), and the interaction of security and off-balance-sheet diversifications (H4\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification (H2), off-balance-sheet diversification (H6), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of

non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For larger community BHCs** - Loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), off-balance-sheet diversification ( $H6$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), and the interaction of domestic geographic and loan diversifications ( $H2*H3$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For regional BHCs** - Domestic geographic diversification ( $H2$ ), loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification ( $H4$ ), the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ )

hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For money center BHCs** - Domestic geographic diversification (H2), security diversification (H4), non-interest-income diversification (H5), off-balance-sheet diversification (H6), the interaction of security diversification and security ratio (H4\*S4), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of all-activity diversifications (H2\*H3\*H4\*H5\*H6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For international BHCs** - Domestic geographic diversification (H2), security diversification (H4), off-balance-sheet diversification (H6), the interaction of security diversification and security ratio (H4\*S4), the interaction of international geographic and loan diversifications (H1\*H3), the interaction of international geographic and non-interest-income diversifications (H1\*H5), and the interaction of all-activity diversifications (H1\*H2\*H3\*H4\*H5\*H6) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, international geographic diversification (H1), loan diversification (H3), non-interest-income diversification (H5), the interaction of international geographic diversification and cross-border loan exposure ratio (H1\*S1), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan

**Table 92: Summary of Percentage of Significant Impacts of Diversifications and Interactions on BHCs' Integral Performance Before The Crisis**

( % )	Variable Abbreviation	Small				Community				Regional				Money Center				International				All BHCs			
		+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
International Geographic Div. (IGD)	H1																0	25	25	0.00					
Domestic Geographic Div. (DGD)	H2	0	8	8	0.00	8	8	17	1.00	50	8	58	6.25	23	0	23	x	17	0	17	X	8	8	17	1.00
Loan Div. (LD)	H3	0	0	0	.	17	0	17	X	33	17	50	1.94	8	8	15	1.00	8	17	25	0.47	42	0	42	X
Security Div. (SD)	H4	8	8	17	1.00	0	17	17	0.00	0	25	25	0.00	8	0	8	X	17	8	25	2.13	17	17	33	1.00
Non-interest-income Div. (NIID)	H5	42	8	50	5.25	33	0	33	X	33	8	42	4.13	23	8	31	2.88	8	33	42	0.24	42	0	42	X
Off-balance-sheet Div. (OBSD)	H6	0	17	17	0.00	8	0	8	X	0	0	0	.	15	0	15	X	25	0	25	X	8	33	42	0.24
Scale interaction																									
International Geographic Div. (IGD)	H1*S1																0	25	25	0.00					
Domestic Geographic Div. (DGD)	H2*S2	0	0	0	.	0	0	0	.	0	25	25	0.00	8	23	31	0.35	0	17	17	0.00	0	17	17	0.00
Loan Div. (LD)	H3*S3	0	25	25	0.00	0	17	17	0.00	17	33	50	0.52	8	15	23	0.53	0	42	42	0.00	0	42	42	0.00
Security Div. (SD)	H4*S4	8	8	17	1.00	8	17	25	0.47	33	8	42	4.13	23	8	31	2.88	17	25	42	1.68	25	17	42	1.47
Non-interest-income Div. (NIID)	H5*S5	0	17	17	0.00	8	8	17	1.00	8	33	42	0.24	0	23	23	0.00	17	17	33	1.00	8	25	33	0.32
Off-balance-sheet Div. (OBSD)	H6*S6	25	8	33	3.13	8	17	25	0.47	33	8	42	4.13	0	8	8	0.00	0	8	8	0.00	17	8	25	2.13
Activity interaction																									
IGD*LD	H1*H3																17	8	25	2.13					
IGD*NIID	H1*H5																42	0	42	X					
DGD * LD	H2*H3	8	8	17	1.00	0	8	8	0.00	33	17	50	1.94	0	15	15	0.00	0	17	17	0.00	17	8	25	2.13
DGD * NIID	H2*H5	0	8	8	0.00	25	17	42	1.47	8	17	25	0.47	23	15	38	1.53	0	50	50	0.00	8	8	17	1.00
SD * OBSD	H4*H6	17	0	17	x	8	0	8	x	0	0	0	.	8	8	15	1.00	8	8	17	1.00	17	8	25	2.13
All Activities	H2*H3*H4*H5*H6	0	0	0	.	8	0	8	x	17	0	17	x	0	8	8	0.00	17	0	17	x	17	8	25	2.13

"+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable, "x" indicates infinity. "." indicates an unavailable item.

"%" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs' integral performance

"Total" indicates the percentage of performance measures on which individual diversification or interaction have significant impacts; +/- indicates the ratio of "+" to "-".

diversification and loan ratio ( $H3*S3$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For all BHCs** - Loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification ( $H6$ ), the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), and the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

c. During the crisis: Table 93 reports the summary of percentage of significant impacts of diversifications and interactions on BHCs' integral performance.

**For small BHCs** - Loan diversification ( $H3$ ), non-interest-income diversification ( $H5$ ), off-balance-sheet diversification ( $H6$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, security diversification

(H4), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5), and the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For larger community BHCs** - Domestic geographic diversification (H2), loan diversification (H3), security diversification (H4), non-interest-income diversification (H5), the interaction of domestic geographic diversification and deposit ratio (H2\*S2), and the interaction of non-interest-income diversification and non-interest-income ratio (H5\*S5) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of loan diversification and loan ratio (H3\*S3), the interaction of security diversification and security ratio (H4\*S4), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), the interaction of domestic geographic and loan diversifications (H2\*H3), and the interaction of domestic geographic and non-interest-income diversifications (H2\*H5) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For regional BHCs** - Loan diversification (H3), non-interest-income diversification (H5), the interaction of off-balance-sheet diversification and off-balance-sheet ratio (H6\*S6), and the interaction of domestic geographic and loan diversifications (H2\*H3) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, the interaction of domestic geographic diversification and deposit ratio (H2\*S2), the interaction of loan diversification and loan ratio (H3\*S3), the interaction of security diversification and security ratio (H4\*S4), the interaction of domestic geographic and non-interest-income diversifications (H2\*H5),

and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For money center BHCs** - Domestic geographic diversification ( $H2$ ), security diversification ( $H4$ ), non-interest-income diversification ( $H5$ ), off-balance-sheet diversification ( $H6$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, loan diversification ( $H3$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For international BHCs** - International geographic diversification ( $H1$ ), loan diversification ( $H3$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of international geographic and non-interest-income diversifications ( $H1*H5$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, domestic geographic diversification ( $H2$ ), security diversification ( $H4$ ), off-balance-sheet diversification ( $H6$ ), the interaction of international geographic diversification and cross-border loan exposure ratio ( $H1*S1$ ),

**Table 93: Summary of Percentage of Significant Impacts of Diversifications and Interactions on BHCs' Integral Performance During The Crisis**

( % )	Variable Abbreviation	Small				Community				Regional				Money Center				International				All BHCs			
		+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Activity diversification																									
International Geographic Div. (IGD)	H1																	17	0	17	x				
Domestic Geographic Div. (DGD)	H2	8	8	17	1.00	33	25	58	1.32	8	8	17	1.00	23	8	31	2.88	0	25	25	0.00	33	8	42	4.13
Loan Div. (LD)	H3	17	0	17	X	33	8	42	4.13	17	0	17	X	0	8	8	0.00	25	0	25	X	58	0	58	X
Security Div. (SD)	H4	0	25	25	0.00	25	0	25	X	0	0	0	.	15	0	15	X	0	50	50	0.00	17	0	17	X
Non-interest-income Div. (NIID)	H5	33	0	33	X	42	0	42	X	8	0	8	X	8	0	8	X	0	0	0	.	33	0	33	X
Off-balance-sheet Div. (OBSD)	H6	8	0	8	X	0	0	0	.	0	0	0	.	23	0	23	X	0	33	33	0.00	0	25	25	0.00
Scale interaction																									
International Geographic Div. (IGD)	H1*S1																	0	17	17	0.00				
Domestic Geographic Div. (DGD)	H2*S2	8	17	25	0.47	25	0	25	X	0	8	8	0.00	15	15	31	1.00	8	17	25	0.47	8	0	8	X
Loan Div. (LD)	H3*S3	0	17	17	0.00	8	17	25	0.47	0	17	17	0.00	8	0	8	X	0	42	42	0.00	0	42	42	0.00
Security Div. (SD)	H4*S4	17	0	17	X	0	17	17	0.00	0	8	8	0.00	31	0	31	X	33	0	33	X	0	8	8	0.00
Non-interest-income Div. (NIID)	H5*S5	0	42	42	0.00	50	8	58	6.25	0	0	0	.	0	8	8	0.00	0	8	8	0.00	17	25	42	0.68
Off-balance-sheet Div. (OBSD)	H6*S6	0	17	17	0.00	0	25	25	0.00	33	25	58	1.32	23	0	23	X	17	8	25	2.13	8	0	8	X
Activity interaction																									
IGD*LD	H1*H3																	0	33	33	0.00				
IGD*NIID	H1*H5																	25	0	25	X				
DGD * LD	H2*H3	8	8	17	1.00	8	25	33	0.32	25	0	25	X	0	8	8	0.00	33	0	33	X	0	25	25	0.00
DGD * NIID	H2*H5	8	0	8	X	0	33	33	0.00	8	17	25	0.47	23	8	31	2.88	17	25	42	0.68	0	42	42	0.00
SD * OBSD	H4*H6	17	8	25	2.13	0	0	0	.	0	0	0	.	0	23	23	0.00	50	0	50	X	17	0	17	x
All Activities	H2*H3*H4*H5*H6	25	17	42	1.47	8	8	17	1.00	0	8	8	0.00	8	0	8	x	17	25	42	0.68	17	0	17	x

"+" indicates favorable impact on dependent variable; "-" indicates unfavorable impact on dependent variable, "x" indicates infinity. "." indicates an unavailable item.

"%" indicates the percentage of individual diversification or interaction which have significant impacts on BHCs' integral performance

"Total" indicates the percentage of performance measures on which individual diversification or interaction have significant impacts; +/- indicates the ratio of "+" to "-".



the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of international geographic and loan diversifications ( $H1*H3$ ), the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ), and the interaction of all-activity diversifications ( $H1*H2*H3*H4*H5*H6$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

**For all BHCs** - Domestic geographic diversification ( $H2$ ), loan diversification ( $H3$ ), security diversification ( $H4$ ), non-interest-income diversification ( $H5$ ), the interaction of domestic geographic diversification and deposit ratio ( $H2*S2$ ), the interaction of off-balance-sheet diversification and off-balance-sheet ratio ( $H6*S6$ ), the interaction of security and off-balance-sheet diversifications ( $H4*H6$ ), and the interaction of all-activity diversifications ( $H2*H3*H4*H5*H6$ ) benefit BHCs with their (+/-) ratios greater than one, indicating that favorable impacts dominate unfavorable impacts. However, off-balance-sheet diversification ( $H6$ ), the interaction of loan diversification and loan ratio ( $H3*S3$ ), the interaction of security diversification and security ratio ( $H4*S4$ ), the interaction of non-interest-income diversification and non-interest-income ratio ( $H5*S5$ ), the interaction of domestic geographic and loan diversifications ( $H2*H3$ ), and the interaction of domestic geographic and non-interest-income diversifications ( $H2*H5$ ) hurt BHCs with their (+/-) ratios less than one, indicating that unfavorable impacts dominate favorable impacts.

## 6.2 Integrated Diversification Effect Analysis

Table 94 - 96 report the number and percentage of significant effects of diversifications and interactions on BHCs performance measures.

a. Total Period:

For all BHCs, 20% of the diversifications and interactions have favorable impacts and 11% have unfavorable impacts on accounting returns. International BHCs have the highest percentage of favorable impacts (17%) while small and money center BHCs have the lowest percentage (7%). On the other hand, international BHCs have the highest percentage of unfavorable impacts (22%) while money center BHCs have the lowest percentage (2%).

For all BHCs, 11% of the diversifications and interactions have favorable impacts and 4% have unfavorable impacts on market returns. Money center BHCs have the highest percentage of favorable impacts (18%) while larger community BHCs have the lowest percentage (4%). On the other hand, international BHCs have the highest percentage of unfavorable impacts (17%) while larger community BHCs have the lowest percentage (0%).

For all BHCs, 14% of the diversifications and interactions have favorable impacts and 14% have unfavorable impacts on credit risk. Small BHCs have the highest percentage of favorable impacts (21%) while international BHCs have the lowest percentage (6%). On the other hand, International BHCs have the highest percentage of unfavorable impacts (22%) while small and money center BHCs have the lowest percentage (7%).

For all BHCs, 16% of the diversifications and interactions have favorable impacts and 11% have unfavorable impacts on market risk. Larger community BHCs have the highest percentage of favorable impacts (18%) while money center BHCs have the lowest percentage (7%). On the other hand, regional BHCs have the highest percentage of unfavorable impacts (13%) while small BHCs have the lowest percentage (7%).

For all BHCs, 14% of the diversifications and interactions have favorable impacts and 0% have unfavorable impacts on default risk. Regional BHCs have the highest percentage of favorable impacts (21%) while larger community and money center BHCs

have the lowest percentage (7%). On the other hand, regional BHCs have the highest percentage of unfavorable impacts (29%) while small, larger community and money center BHCs have the lowest percentage (0%).

B. Before the crisis:

For all BHCs, 20% of the diversifications and interactions have favorable impacts and 14% have unfavorable impacts on accounting returns. Regional BHCs have the highest percentage of favorable impacts (21%) while small and money center BHCs have the lowest percentage (5%). On the other hand, international BHCs have the highest percentage of unfavorable impacts (18%) while money center BHCs have the lowest percentage (4%).

For all BHCs, 11% of the diversifications and interactions have favorable impacts and 14% have unfavorable impacts on market returns. Regional BHCs have the highest percentage of favorable impacts (21%) while small BHCs have the lowest percentage (4%). On the other hand, international BHCs have the highest percentage of unfavorable impacts (31%) while larger community BHCs have the lowest percentage (4%). For all BHCs, 14% of the diversifications and interactions have favorable impacts and 14% have unfavorable impacts on credit risk. Regional BHCs have the highest percentage of favorable impacts (29%) while international BHCs have the lowest percentage (11%). On the other hand, International BHCs have the highest percentage of unfavorable impacts (22%) while small and larger community BHCs have the lowest percentage (14%).

For all BHCs, 14% of the diversifications and interactions have favorable impacts and 16% have unfavorable impacts on market risk. Larger community and regional BHCs have the highest percentage of favorable impacts (13%) while international BHCs have the lowest percentage (3%). On the other hand, regional BHCs have the highest percentage of unfavorable impacts (14%) while small BHCs have the lowest percentage (4%).

**Table 94: Number of Significant Effects of Diversifications and Interactions**

**For BHC Sub-groups for Total Period**

\* For each performance measure, 14 diversification and interaction measures

(5 diversifications and 9 interactions) for small, larger community, regional, money center and all BHCs

\*\* For each performance measure, 18 diversification and interaction measures

(6 diversifications and 12 interactions) for international BHCs

	<u>Small</u>		<u>Community</u>		<u>Regional</u>		<u>Money Center</u>		<u>International</u>		<u>All BHCs</u>	
	+	-	+	-	+	-	+	-	+	-	+	-
<b>Accounting returns</b>												
ROA	2	2	5	4	1	0	1	0	3	4	5	4
Risk-adjusted ROA	0	1	1	0	3	2	0	0	3	4	2	0
ROE	2	2	2	2	1	0	2	1	3	4	3	2
Risk-adjusted ROE	0	1	1	0	2	2	1	0	3	4	1	0
Sub-total	4	6	9	6	7	4	4	1	12	16	11	6
Percentage	7%	11%	16%	11%	13%	7%	7%	2%	17%	22%	20%	11%
<b>Market returns</b>												
Stock return	1	2	0	0	2	1	3	1	1	3	1	0
Risk-adjusted stock return	2	2	1	0	1	2	2	1	1	3	2	1
Sub-total	3	4	1	0	3	3	5	2	2	6	3	1
Percentage	11%	14%	4%	0%	11%	11%	18%	7%	6%	17%	11%	4%
<b>Credit risk</b>												
Net charge-off ratio	3	1	2	3	2	2	1	1	1	4	2	2
Percentage	21%	7%	14%	21%	14%	14%	7%	7%	6%	22%	14%	14%
<b>Market risk</b>												
Maturity gap ratio	2	1	4	2	4	3	3	3	3	4	4	1
Derivatives loss ratio	1	2	2	2	1	1	0	1	1	1	1	2
Market beta	2	1	2	0	3	2	0	0	2	2	3	0
Interest rate beta	1	0	2	1	1	1	1	1	1	0	1	3
Sub-total	6	4	10	5	9	7	4	5	7	7	9	6
Percentage	11%	7%	18%	9%	16%	13%	7%	9%	10%	10%	16%	11%
<b>Default risk</b>												
Z - score	2	0	1	0	3	4	1	0	3	5	2	0
Percentage	14%	0%	7%	0%	21%	29%	7%	0%	17%	28%	14%	0%
Total	18	15	23	14	24	20	15	9	25	38	27	15
Percentage	11%	9%	14%	8%	14%	12%	9%	5%	12%	18%	16%	9%

"+" indicates favorable impact on dependent variable

"-" indicates unfavorable impact on dependent variable

Percentage: The percentage of total diversification and interaction measures

which have significant impacts on BHCs performance measures.

For example: the 11% for favorable impact on small BHCs performance = 18 / (14\*12)

(14 diversification and interactions measures for each of 12 BHCs performance measures)

**Table 95: Number of Significant Effects of Diversifications and Interactions****For BHC Sub-groups Before The Crisis**

- \* For each performance measure, 14 diversification and interaction measures  
(5 diversifications and 9 interactions) for small, larger community, regional, money center and all BHCs
- \*\* For each performance measure, 18 diversification and interaction measures  
(6 diversifications and 12 interactions) for international BHCs

	<u>Small</u>		<u>Community</u>		<u>Regional</u>		<u>Money Center</u>		<u>International</u>		<u>All BHCs</u>	
	+	-	+	-	+	-	+	-	+	-	+	-
<b>Accounting returns</b>												
ROA	2	3	3	4	3	0	0	0	2	2	5	4
Risk-adjusted ROA	0	0	1	0	3	2	1	1	2	4	2	1
ROE	1	2	1	1	3	0	0	0	2	2	2	2
Risk-adjusted ROE	0	1	0	0	3	3	2	1	4	5	2	1
Sub-total	3	6	5	5	12	5	3	2	10	13	11	8
Percentage	5%	11%	9%	9%	21%	9%	5%	4%	14%	18%	20%	14%
<b>Market returns</b>												
Stock return	0	0	0	0	3	2	2	3	4	6	2	2
Risk-adjusted stock return	1	3	2	1	3	3	2	2	3	5	1	2
Sub-total	1	3	2	1	6	5	4	5	7	11	3	4
Percentage	4%	11%	7%	4%	21%	18%	14%	18%	19%	31%	11%	14%
<b>Credit risk</b>												
Net charge-off ratio	3	2	1	2	4	3	2	3	2	4	2	2
Percentage	21%	14%	7%	14%	29%	21%	14%	21%	11%	22%	14%	14%
<b>Market risk</b>												
Maturity gap ratio	1	0	4	2	3	3	2	4	1	2	4	2
Derivatives loss ratio	1	1	2	2	0	1	1	1	0	0	1	4
Market beta	3	1	1	0	2	2	1	0	0	0	2	1
Interest rate beta	0	0	0	1	2	2	1	1	1	2	1	2
Sub-total	5	2	7	5	7	8	5	6	2	4	8	9
Percentage	9%	4%	13%	9%	13%	14%	9%	11%	3%	6%	14%	16%
<b>Default risk</b>												
Z - score	1	1	1	0	3	3	2	0	2	4	3	1
Percentage	7%	7%	7%	0%	21%	21%	14%	0%	11%	22%	21%	7%
Total	13	14	16	13	32	24	16	16	23	36	27	24
Percentage	8%	8%	10%	8%	19%	14%	10%	10%	11%	17%	16%	14%

"+" indicates favorable impact on dependent variable

"-" indicates unfavorable impact on dependent variable

Percentage: The percentage of total diversification and interaction measures

which have significant impacts on BHCs performance measures.

For example: the 8% for favorable impact on small BHCs performance =  $13 / (14 \times 12)$

(14 diversification and interactions measures for each of 12 BHCs performance measures)

**Table 96: Number of Significant Effects of Diversifications and Interactions  
For BHC Sub-groups During The Crisis**

\* For each performance measure, 14 diversification and interaction measures  
(5 diversifications and 9 interactions) for small, larger community, regional, money center and all BHCs

\*\* For each performance measure, 18 diversification and interaction measures  
(6 diversifications and 12 interactions) for international BHCs

	Small		Community		Regional		Money Center		International		All BHCs	
	+	-	+	-	+	-	+	-	+	-	+	-
<b>Accounting returns</b>												
ROA	2	2	3	2	0	0	3	0	2	2	2	1
Risk-adjusted ROA	1	1	4	2	0	1	0	0	4	7	4	0
ROE	3	1	2	2	0	0	2	1	4	3	2	1
Risk-adjusted ROE	1	1	5	1	0	1	1	0	7	7	2	1
Sub-total	7	5	14	7	0	2	6	1	17	19	10	3
Percentage	13%	9%	25%	13%	0%	4%	11%	2%	24%	26%	18%	5%
<b>Market returns</b>												
Stock return	0	0	0	0	2	2	5	2	2	1	3	1
Risk-adjusted stock return	0	2	0	1	2	1	4	2	2	1	3	3
Sub-total	0	2	0	1	4	3	9	4	4	2	6	4
Percentage	0%	7%	0%	4%	14%	11%	32%	14%	11%	6%	21%	14%
<b>Credit risk</b>												
Net charge-off ratio	4	2	2	2	1	1	1	0	0	0	2	2
Percentage	29%	14%	14%	14%	7%	7%	7%	0%	0%	0%	14%	14%
<b>Market risk</b>												
Maturity gap ratio	2	3	4	2	1	1	3	1	1	1	2	1
Derivatives loss ratio	1	2	2	4	0	0	1	0	1	4	2	4
Market beta	3	3	2	3	3	2	0	0	1	3	2	1
Interest rate beta	1	2	0	1	2	1	3	3	0	0	1	2
Sub-total	7	10	8	10	6	4	7	4	3	8	7	8
Percentage	13%	18%	14%	18%	11%	7%	13%	7%	4%	11%	13%	14%
<b>Default risk</b>												
Z - score	0	0	4	1	0	1	0	0	5	5	3	1
Percentage	0%	0%	29%	7%	0%	7%	0%	0%	28%	28%	21%	7%
Total	18	19	28	21	11	11	23	9	29	34	28	18
Percentage	11%	11%	17%	13%	7%	7%	14%	5%	13%	16%	17%	11%

"+" indicates favorable impact on dependent variable

"-" indicates unfavorable impact on dependent variable

Percentage: The percentage of total diversification and interaction measures  
which have significant impacts on BHCs performance measures.

For example: the 11% for favorable impact on small BHCs performance =  $18 / (14 \times 12)$

(14 diversification and interactions measures for each of 12 BHCs performance measures)

For all BHCs, 21% of the diversifications and interactions have favorable impacts and 7% have unfavorable impacts on default risk. Regional BHCs have the highest percentage of favorable impacts (21%) while small and larger community BHCs have the lowest percentage (7%). On the other hand, international BHCs have the highest percentage of unfavorable impacts (22%) while larger community and money center BHCs have the lowest percentage (0%).

C. During the crisis:

For all BHCs, 18% of the diversifications and interactions have favorable impacts and 5% have unfavorable impacts on accounting returns. Larger community BHCs have the highest percentage of favorable impacts (25%) while regional BHCs have the lowest percentage (0%). On the other hand, international BHCs have the highest percentage of unfavorable impacts (26%) while money center BHCs have the lowest percentage (2%).

For all BHCs, 21% of the diversifications and interactions have favorable impacts and 14% have unfavorable impacts on market returns. Money center BHCs have the highest percentage of favorable impacts (14%) while larger community BHCs have the lowest percentage (0%). On the other hand, money center BHCs have the highest percentage of unfavorable impacts (14%) while larger community BHCs have the lowest percentage (4%).

For all BHCs, 14% of the diversifications and interactions have favorable impacts and 14% have unfavorable impacts on credit risk. Small BHCs have the highest percentage of favorable impacts (29%) while international BHCs have the lowest percentage (0%). On the other hand, small and larger community BHCs have the highest percentage of unfavorable impacts (14%) while money center and international BHCs have the lowest percentage (0%).

For all BHCs, 13% of the diversifications and interactions have favorable impacts and 14% have unfavorable impacts on market risk. Larger community BHCs have the highest

percentage of favorable impacts (14%) while international BHCs have the lowest percentage (4%). On the other hand, small and larger community BHCs have the highest percentage of unfavorable impacts (18%) while regional and money center BHCs have the lowest percentage (7%).

For all BHCs, 21% of the diversifications and interactions have favorable impacts and 7% have unfavorable impacts on default risk. Larger community BHCs have the highest percentage of favorable impacts (29%) while small, regional and money center BHCs have the lowest percentage (0%). On the other hand, international BHCs have the highest percentage of unfavorable impacts (28%) while small and money center BHCs have the lowest percentage (0%).

Table 97 reports the summary of significant impacts of diversifications and interactions on performance for all BHCs groups and periods.

#### A. Total period:

For all BHCs, 25% of the diversifications and interactions have impacts on performances. International BHCs have the highest percentage impacts (30%) while money center BHCs have the lowest percentage impacts (14%). On the other hand, small, larger community, regional and money center BHCs have their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. Therefore, diversifications advantage BHCs relatively. The results show a consistency with the hypothesis of the portfolio theory for these BHCs. However, for international BHCs their (+/-) ratio is less than one (0.67), indicating that diversifications disadvantage BHCs relatively. Therefore, the results show a consistency with the hypothesis of the agency theory for international BHCs.

#### B. Before the crisis:

For all BHCs, 30% of the diversifications and interactions have impacts on performances. Regional BHCs have the highest percentage impacts (33%) while small



BHCs have the lowest percentage impacts (16%). On the other hand, small, larger community, regional and money center BHCs have their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. Therefore, diversifications advantage BHCs relatively. The results show a consistency with the hypothesis of the portfolio theory for these BHCs. However, for international BHCs their (+/-) ratio is less than one (0.65), indicating that diversifications disadvantage BHCs relatively. Therefore, the results show an inconsistency with the hypothesis of the agency theory for international BHCs.

#### C. During the crisis:

For all BHCs, 28% of the diversifications and interactions have impacts on performances. Larger community BHCs have the highest percentage impacts (30%) while regional BHCs have the lowest percentage impacts (14%). On the other hand, small, larger community, regional and money center BHCs have their (+/-) ratio greater than one, indicating that favorable impacts dominate unfavorable impacts. Therefore, diversifications advantage BHCs relatively. The results show a consistency with the hypothesis of the portfolio theory for these BHCs. However, for international BHCs their (+/-) ratio is less than one (0.81), indicating that diversifications disadvantage BHCs relatively. Therefore, the results show an inconsistency with the hypothesis of the agency theory for international BHCs.

This study finds that diversifications basically benefit all BHCs except for international BHCs. For domestic BHCs, the benefits of diversified portfolio dominate the incurred agency costs. While for international BHCs, agency costs dominate the benefits of diversified portfolio.

**Table 97: Summary of Significant Impacts of Diversifications and Interactions on BHCs Performance**

	<u>Total period</u>				<u>Before the crisis</u>				<u>During the crisis</u>			
	+	-	Total	+/-	+	-	Total	+/-	+	-	Total	+/-
Small BHCs	11%	9%	20%	1.22	8%	8%	16%	1.00	11%	11%	22%	1.00
Larger community BHCs	14%	8%	22%	1.75	10%	8%	18%	1.25	17%	13%	30%	1.31
Regional BHCs	14%	12%	26%	1.17	19%	14%	33%	1.36	7%	7%	14%	1.00
Money center BHCs	9%	5%	14%	1.80	10%	10%	20%	1.00	14%	5%	19%	2.80
International BHCs	12%	18%	30%	0.67	11%	17%	28%	0.65	13%	16%	29%	0.81
All BHCs	16%	9%	25%	1.78	16%	14%	30%	1.14	17%	11%	28%	1.55

"+" indicates favorable impact on dependent variable

"-" indicates unfavorable impact on dependent variable

Percentage: The percentage of total diversification and interaction measures

which have significant impacts on BHCs performance measures.

"Total" indicates the percentage of performance measures on which individual diversification or interaction have significant impacts; +/- indicates the ratio of "+" to "-".

### 6.3 Interaction Effect of M&A and Diversification Analysis

M&A is a common way for BHCs to expand. It is usually associated with several forms of diversification. For example, BHCs could acquire other BHCs which provide similar services in different areas to expand and diversify geographically. On the other hand, BHCs could also merge other BHCs which provide different types of loans in the same area to expand and diversify their loan portfolios. Diversifications have been empirically shown in prior sections to yield favorable and unfavorable impacts on performance. Therefore, whether BHCs benefit by engaging in M&A activity to diversify their portfolios is an important issue. Specifically, what types of diversification-associated M&A activity BHCs should employ is an important issue.

Table 98 reports panel regression results which include the interactions of merger dummy and diversification variables as explanatory variables to test the impacts of diversification-associated mergers on performance for all BHCs for the total period. BHCs are expected to merge to take advantages of financial benefits. Therefore, the regression coefficients on the merger-diversification interaction terms are expected to have a positive or favorable impact on BHCs' performance. For example, the interaction of the merger and domestic geographic diversification variable ( $C4*H2$ ) has a significant and positive impact on ROA and distance to default ( $Z$ ), with regression coefficients of 0.0007 and 24.8, respectively. The interaction of the merger and non-interest-income diversification variable ( $C4*H5$ ) has a significant and favorable (negative) impact on net charge-offs (NCO) with a coefficient of -0.0005. The interaction of the merger and off-balance-sheet diversification variable ( $C4*H6$ ) has a significant and positive impact on stock return (SR) with the coefficient of 0.0847.

Thus, the results indicate that mergers associated with domestic geographic diversification have favorable impacts on BHCs' accounting returns and default risk.

**Table 98 : Regressions for All BHCs for Total Period**

Variables	Variable Abbreviation	Expected Sign	ROA	Std. Error	SR	Std. Error	NCO	Std. Error	MB	Std. Error	Z	Std. Error
<b>Activity diversification</b>												
	C		-0.0062	0.0012 ***	-0.0794	0.0501	-0.0036	0.0010 ***	-3.0567	0.4161 ***	-18.2	107.0
Domestic Geographic Div. (DGD)	H2	?	-0.0117	0.0041 ***	0.1166	0.0927	-0.0016	0.0017	0.3584	0.4248	-24.4	100.5
Loan Div. (LD)	H3	?	0.0064	0.0025 **	0.0615	0.0598	-0.0004	0.0013	-0.0483	0.2625	64.3	109.1
Security Div. (SD)	H4	?	-0.0015	0.0004 ***	0.0489	0.0189 ***	0.0003	0.0003	-0.0120	0.0720	-7.0	16.0
Non-interest-income Div. (NIID)	H5	?	0.0024	0.0010 **	0.0197	0.0195	-0.0006	0.0004 *	-0.1212	0.0667 *	26.1	11.6 **
Off-balance-sheet Div. (OBSD)	H6	?	-0.0007	0.0004	0.0118	0.0199	0.0006	0.0003 **	0.0261	0.0762	-11.2	21.3
<b>Scale variables</b>												
Deposit Ratio	S2	+	0.0004	0.0009	0.0525	0.0247 **	0.0003	0.0006	0.1261	0.1082	112.8	32.3 ***
Loan Ratio	S3	+	0.0105	0.0022 ***	0.0358	0.0512	0.0016	0.0010	0.1728	0.2316	154.0	95.6
Security Ratio	S4	+	0.0036	0.0007 ***	0.0994	0.0392 **	0.0000	0.0004	-0.0907	0.1522	30.3	38.3
Non-interest-income Ratio	S5	+	0.4718	0.1155 ***	1.8212	2.7153	0.0849	0.0445 *	-4.0814	3.6004	-808.8	473.7 *
Off-balance-sheet Ratio	S6	?	-0.0001	0.0001	-0.0029	0.0053	-0.0001	0.0000 ***	-0.0016	0.0036	-0.1	1.3
<b>Scale interaction</b>												
Domestic Geographic Div. (DGD)	H2*S2	?	0.0052	0.0034	-0.1063	0.0781	-0.0008	0.0018	-0.2815	0.4259	-107.7	84.8
Loan Div. (LD)	H3*S3	?	-0.0102	0.0038 ***	-0.0650	0.0927	0.0005	0.0018	0.0155	0.4628	-153.0	192.4
Security Div. (SD)	H4*S4	?	0.0048	0.0012 ***	-0.0913	0.0669	-0.0012	0.0010	-0.2294	0.2626	183.5	79.7 **
Non-interest-income Div. (NIID)	H5*S5	?	-0.3825	0.2132 *	-1.2024	4.9791	-0.0282	0.1209	6.4937	5.9285	185.2	664.9
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0002	0.0002	0.0058	0.0091	0.0002	0.0001 **	-0.0215	0.0110 *	0.0	3.6
<b>Activity interaction</b>												
DGD * LD	H2*H3	?	0.0087	0.0032 ***	-0.0648	0.1037	0.0023	0.0015	-0.0274	0.5142	219.4	161.1
DGD * NIID	H2*H5	?	0.0052	0.0020 ***	-0.0023	0.0715	0.0013	0.0009	-0.2189	0.1902	19.2	68.7
SD * OBSD	H4*H6	?	-0.0001	0.0008	-0.0451	0.0383	-0.0014	0.0005 ***	0.1327	0.1210	19.0	36.9
All Activities	H2*H3*H4*H5*H6	?	-0.0004	0.0062	-0.3584	0.2371	0.0007	0.0038	-1.6650	0.7858 **	-586.5	349.7 *
<b>Merger interaction</b>												
Merger*DGD	C4*H2	+	0.0007	0.0004 *	0.0152	0.0314	0.0000	0.0002	0.0155	0.0209	24.8	13.7 *
Merger*LD	C4*H3	+	0.0001	0.0006	-0.0837	0.0620	-0.0002	0.0003	0.0596	0.0400	33.1	23.3
Merger*SD	C4*H4	+	0.0001	0.0005	0.0392	0.0413	0.0001	0.0002	0.0467	0.0285	2.1	14.0
Merger*NIID	C4*H5	+	-0.0002	0.0007	-0.0652	0.0498	-0.0005	0.0002 **	-0.0459	0.0359	10.0	18.4
Merger*OBSD	C4*H6	+	-0.0004	0.0005	0.0847	0.0404 **	0.0003	0.0003	0.0229	0.0273	2.5	17.7
<b>Control variables</b>												
International Loan Activity Dummy	ILAD		0.0014	0.0003 ***	0.0154	0.0103	-0.0003	0.0003	-0.0184	0.1329	19.0	40.3
Log Asset	C1	?	-0.0001	0.0001	-0.0017	0.0049	0.0004	0.0001 ***	0.5122	0.0529 ***	0.7	14.0
Equity Ratio	C2	?	0.0241	0.0061 ***	0.1347	0.1167	0.0045	0.0031	0.3122	0.6017	1170.7	187.0 ***
Asset Growth	C3	+	0.0005	0.0010	0.1894	0.0467 ***	0.0002	0.0003	-0.0653	0.0262 **	-6.0	11.1
Merger Dummy	C4	?	0.0001	0.0004	0.0331	0.0400	0.0002	0.0002	-0.0407	0.0248	-29.5	16.3 *
Merger * Asset Growth	C4*C3	?	-0.0017	0.0010	-0.2023	0.0592 ***	0.0001	0.0004	0.0046	0.0512	-26.2	24.7
Year 1999 Dummy	Y99		-0.0005	0.0002 ***	-0.0553	0.0164 ***	0.0002	0.0001 ***	0.0191	0.0075 **	-11.1	2.8 ***
Year 2000 Dummy	Y00		-0.0006	0.0002 ***	-0.0042	0.0160	0.0003	0.0001 ***	0.0570	0.0128 ***	-21.9	4.5 ***
Year 2001 Dummy	Y01		-0.0024	0.0004 ***	0.0228	0.0170	0.0006	0.0002 **	0.1371	0.0252 ***	-56.9	9.5 ***
Year 2002 Dummy	Y02		-0.0020	0.0004 ***	-0.0160	0.0168	0.0005	0.0002 **	0.1737	0.0277 ***	-74.2	10.5 ***
Year 2003 Dummy	Y03		-0.0022	0.0004 ***	0.0359	0.0167 **	0.0005	0.0002 **	0.2045	0.0316 ***	-84.4	11.5 ***
Year 2004 Dummy	Y04		-0.0022	0.0004 ***	-0.0092	0.0165	0.0004	0.0002 *	0.2434	0.0348 ***	-77.6	12.5 ***
Year 2005 Dummy	Y05		-0.0022	0.0004 ***	-0.0386	0.0163 **	0.0003	0.0002	0.2891	0.0379 ***	-82.5	13.3 ***
Year 2006 Dummy	Y06		-0.0023	0.0004 ***	-0.0085	0.0163	0.0003	0.0002	0.4535	0.0405 ***	-94.5	13.9 ***
Year 2007 Dummy	Y07		-0.0030	0.0005 ***	-0.1042	0.0166 ***	0.0006	0.0002 **	0.4968	0.0443 ***	-107.9	14.7 ***
Year 2008 Dummy	Y08		-0.0043	0.0005 ***	-0.0807	0.0227 ***	0.0011	0.0002 ***	0.5466	0.0468 ***	-126.6	15.5 ***
First-order Coefficient of Autocorrelation	AR(1)		0.4255	0.0611 ***	-0.2198	0.0254 ***	0.5676	0.1171 ***	0.9558	0.0064 ***	0.9	0.0 ***
Observations			18121		4878		18121		4878		18121	
Adjusted R-squared			0.5477		0.1274		0.4931		0.9529		0.8388	

ROA: return on asset; SR: stock return; NCO: net charge-offs; MB: market beta; Z: distance to default

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

Mergers associated with non-interest-income diversification have a favorable impact on BHC's credit risk perhaps due to the fact that greater reliance on non-interest income implies a reduced reliance on risky loans which reduce a bank's credit risk. Furthermore, mergers associated with off-balance-sheet diversification have a favorable impact on BHCs' market returns. Although only a few merger-diversification regression coefficients are significant, they all support the hypothesis of favorable portfolio benefits and cost synergies.

#### **6.4 Response Elasticity Analysis**

Table 99 reports the significant performance response elasticities for all BHCs for the total period. Response elasticities, which equal the percentage change in the bank performance measures divided by the percentage change in the diversification measures, help to compare the relative importance of the statistical results.

For accounting returns, a ten percent increase in loan (H3) and non-interest-income diversification (H5) would increase BHCs' ROA by 10% and 4.2%, respectively. A ten percent increase in domestic geographic (H2) and security diversifications (H4) would both decrease BHCs' ROA by 2.3%. A ten percent increase in non-interest-income diversification (H5) would increase BHCs' risk-adjusted ROA (RAROA) by 0.8%. A ten percent increase in security diversification (H4) would decrease BHCs' ROE by 0.9%. Moreover, a ten percent increase in non-interest-income diversification (H5) would increase BHCs' risk-adjusted ROE (RAROE) by 0.9%.

For market returns, a ten percent increase in security diversification (H4) would increase BHCs' stock return (SR) by 13.4%. A ten percent increase in loan (H3) and security diversifications (H4) would increase BHCs' risk-adjusted stock return (RASR) by 28.9% and 10%, respectively. The impact of loan diversification on RASR is almost

three times the impact of security diversification.

For credit risk, a ten percent increase in non-interest-income diversification (H5) would decrease BHCs' net charge-offs (NCO) by 5.1%. However, a ten percent increase in off-balance-sheet diversification (H6) would increase BHCs' net charge-offs (NCO) by 1.9%.

For market risk, a ten percent increase in off-balance-sheet diversification (H6) would increase BHCs' maturity gap (MG) by 0.7%. A ten percent increase in off-balance-sheet diversification (H6) would increase BHCs' derivatives losses (DL) by 44.8%. A ten percent increase in non-interest-income diversification (H5) would decrease BHCs' market beta (MB) by 0.9%. Finally, a ten percent increase in off-balance-sheet diversification (H6) would decrease BHCs' interest rate beta (IRB) by 20.7%.

For default risk, a ten percent increase in non-interest-income diversification (H5) would increase BHCs' distance to default (Z) by 0.6%.

In general, the results indicate that non-interest-income diversification has the most consistent and favorable impact on BHCs' performance. It both increases the returns and reduces portfolio risk. Security diversification has an unfavorable impact on accounting returns but favorable impacts on market returns. Off-balance-sheet diversification has unfavorable impacts on various types of risk while making no positive contribution to BHCs' returns. The largest unfavorable impact is on derivatives losses (DL) where the elasticity is equal to 4.48. The result indicates that the wider the range of off-balance-sheet activities, the greater the risk of derivatives losses that BHCs may encounter. Furthermore, the elasticity between loan diversification and risk-adjusted stock return is quite large and favorable (2.89), suggesting that a ten percent increase in loan diversification will lead to a 28.9% improvement in risk-adjusted stock return. On the other hand, a ten percent increase in off-balance-sheet diversification reduces the BHCs' interest rate beta by 20.7% since many derivatives are commonly used to hedge

**Table 99: Significant Response Elasticities for Change in the Performance Measures for All BHCs for Total Period**

Variables	Variable Abbreviation	ROA	RAROA	ROE	RAROE	SR	RASR	NCO	MG	DL	MB	IRB	Z
Domestic Geographic Div.	H2	-0.2309 ***											
Loan Div.	H3	0.9973 **					2.8927 *						
Security Div.	H4	-0.2281 ***		-0.0890 **		1.3445 ***	0.9886 **						
Non-interest-income Div.	H5	0.4155 **	0.0754 ***		0.0853 ***			-0.5080 *			-0.0855 *		0.0570 **
Off-balance-sheet Div.	H6							0.1900 **	0.0681 **	4.4801 *		-2.0682 **	

ROA: return on asset; RAROA: risk-adjusted ROA; ROE: return on equity; RAROE: risk-adjusted ROE; SR: stock return; RASR: risk-adjusted SR;

NCO: net charge-offs; MG: maturity gap; DL: derivatives losses; MB: market beta; IRB: interest rate beta; Z: distance to default

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

interest rate risk. This interpretation is also consistent with the positive coefficient on maturity gap (MG) of 0.0681.



## **CHAPTER VII**

### **CONCLUSIONS AND FUTURE RESEARCH**

Bank holding companies (BHCs) are hypothesized to achieve potential portfolio and synergistic benefits through various forms of diversification, such as, domestic and international geographic diversification, loan and security diversification, and non-interest-income and off-balance-sheet diversification. Over the sample period deregulation has enabled BHCs to greatly expand their diversification efforts. On the other hand, diversification can generate new managerial problems or agency costs. This dissertation examines five issues. 1) Do all the various forms of diversification have the same favorable/unfavorable effects on BHCs' performance?, 2) Are there any interaction effects among the various types of diversification?, 3) Since the business strategies of large BHCs are different from those of small BHCs, do the diversification effects vary by size?, 4) How did diversification impact BHC performance during the 2007-2008 financial crisis?, and 5) What types of diversification-associated M&A should BHCs employ to take advantages of diversification benefits?

**Overall Results** - The study finds that not all forms of diversifications have the same impacts on BHCs' performance. Some types of diversification support the hypothesis of favorable portfolio benefits and cost synergies, while other findings support the

hypothesis of unfavorable agency costs. For example, for all BHCs for the total period, loan and non-interest-income diversifications have favorable impacts on ROA, while domestic geographic and security diversifications have unfavorable impacts on ROA. A ten percent increase in loan and non-interest-income diversifications would increase BHCs' ROA by 10% and 4.2%, respectively. A ten percent increase in domestic geographic and security diversifications would both decrease BHCs' ROA by 2.3%. The findings indicate that non-interest-income diversification has the strongest favorable impacts on BHCs' performance as it both increases returns and reduces portfolio risk. Security diversification has unfavorable impacts on accounting returns but favorable impacts on market returns. Off-balance-sheet diversification has unfavorable impacts on risk and it does not contribute to BHCs' returns. The largest unfavorable impact is on derivatives losses. The result indicates that the wider the range of off-balance-sheet activities, the higher the risk of derivatives losses that BHCs encounter.

Moreover, for some diversification measures, the impacts depend on the scale of their associated activities. When the scale of the diversified activity is large enough, the net diversification impact may change its sign. For example, when the scale of the security portfolio relative to total asset is less than 0.0022, the net impact of security diversification on ROA for small BHCs is favorable, while it becomes unfavorable when the scale is greater than 0.0022. The results show that diversification might become difficult to manage if the scale of the activity is too large. The study finds that, in general, among the various diversified activities where the sign of the impacts switch with scales, loan diversification switches direction from favorable to unfavorable. The results indicate that BHCs might tend to make increasingly risky loans when their scale of loans expands. Moreover, agency problems might also become difficult to control. On the other hand, security diversification tends to switch the direction of impact from unfavorable to favorable. The results indicate that with larger security portfolios, BHCs are more

capable of reducing risk and increasing returns with a wide selection of securities.

**Results for Various Size Banks** - For small banks, larger community banks, and regional BHCs, non-interest-income and loan diversifications generally enhance performance while security portfolio and off-balance sheet diversifications reduce performance. For very large money center banks, diversification into off-balance-sheet activities generates the strongest performance benefit, while domestic geographic, loan and non-interest income diversifications also have favorable impacts. On the other hand, security portfolio diversification has a mix of both favorable and unfavorable effects. Focusing on BHCs with international loan portfolios, off-balance-sheet diversification creates the strongest performance benefits, followed by domestic geographic diversification. On the other hand, international geographic and loan diversifications, along with security portfolio and non-interest income diversifications reduce bank performance.

Over all, it appears that larger banks (with the exception of international banks) achieve more favorable diversification benefits. On the other hand, the interaction effects of various forms of diversifications appear to benefit small BHCs the most. For small and larger community BHCs, the interactions of domestic geographic and non-interest-income diversifications, security and off-balance-sheet diversification, and “all-activity” diversification generally enhance performance, while they reduce performance for regional, money center and international BHCs. Thus, the results show that smaller BHCs may not benefit through single channel diversification because doing so likely increases operating costs while the bank remains unable to fulfill their target customers’ full range of service needs. However, by multi-channel diversification, the interaction benefits of diversifications can be achieved. On the other hand, larger BHCs can benefit through single channel diversification because they have more market power and are able to enjoy the benefits of diversified portfolios and cost synergies generated

through economies of scale. However, multi-channel diversification may make larger BHCs more difficult to manage. For example, they might engage in unfamiliar and risky business where operating and agency costs offset potential portfolio benefits.

Overall, diversification generally supports the hypothesis of favorable portfolio benefits and cost synergies. Furthermore, diversification has a consistently more favorable impact during the recent financial crisis. That is, the results show that diversification plays a more important role in hedging risk and increasing returns during the financial crisis. In general, BHCs with widely diversified activities will suffer less than other BHCs with concentrated activities when financial crisis occurs.

**Impact of Merger Activity** - The study also finds that M&A activity associated with several forms of diversification improve BHC performance. Mergers associated with domestic geographic diversification have favorable impacts on accounting returns and default risk. Mergers associated with non-interest-income diversification have a favorable impact on credit risk. Furthermore, mergers associated with off-balance-sheet diversification have favorable impact on market returns. Thus, the results support the hypothesis of favorable portfolio benefits and cost synergies. The overall implications for BHCs are that not all diversification-driven mergers generate benefits for BHCs. Hence, BHCs should choose the right mergers which meet their business goals.

### **Suggestions for Future Research**

The prime objective of research on bank M&A activity in the literature is to identify motives for consolidation. Motives such as economies of scale and scope, managerial efficiency, risk diversification, and income improvement have been studied extensively. However, few studies specifically examine M&As in terms of their associated diversification benefits. Wagner (2008) presents a model to show that even though consolidation brings about diversification gains, a financial institution's stability may decline since the institution's incentives for taking on risk may increase and the need to

insure adequate liquidity may deteriorate. Empirical results in prior papers focus on the impact of M&A activity on risk and returns. However, these studies have few implications to guide banks in their M&A decisions. In this study, activity diversification has been shown to have both favorable/unfavorable effects on banks' performance. Different forms of M&A activity generate different types of activity diversification and, thus, are expected to have different impacts on banks' performance. Therefore, M&A activity should be categorized and analyzed according to their relative diversification impacts when M&A issues are studied. This will allow future research to explore more fully the implication for bank M&A activity. This dissertation examines the issue assuming that the impacts of merger-diversification interaction are contemporaneous. However, the effects of M&A activity might emerge over a considerable period of time. Thus, the long term implication of merger-diversification strategies need to be examined in future research.

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## **APPENDICES**

# Appendix 1: Return on Asset (ROA) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROA	Std. Error	ROA	Std. Error	ROA	Std. Error
Activity diversification								
	C		0.0018	0.0021	0.0019	0.0019	-0.0077	0.0059
Domestic Geographic Div. (DGD)	H2	?	-0.0020	0.0110	-0.0003	0.0119	-0.0208	0.0235
Loan Div. (LD)	H3	?	0.0010	0.0016	0.0014	0.0017	0.0113	0.0040 ***
Security Div. (SD)	H4	?	-0.0010	0.0005 *	-0.0007	0.0004 *	-0.0014	0.0022
Non-interest-income Div. (NIID)	H5	?	0.0025	0.0007 ***	0.0028	0.0006 ***	0.0021	0.0013
Off-balance-sheet Div. (OBSD)	H6	?	-0.0005	0.0007	-0.0003	0.0006	0.0003	0.0026
Scale variables								
Deposit Ratio	S2	+	0.0026	0.0007 ***	0.0030	0.0006 ***	-0.0005	0.0018
Loan Ratio	S3	+	0.0036	0.0012 ***	0.0036	0.0012 ***	0.0115	0.0039 ***
Security Ratio	S4	+	0.0001	0.0011	0.0001	0.0010	0.0043	0.0046
Non-interest-income Ratio	S5	+	0.6794	0.1624 ***	0.7496	0.1545 ***	0.2837	0.1349 **
Off-balance-sheet Ratio	S6	?	0.0018	0.0005 ***	0.0016	0.0005 ***	0.0034	0.0016 **
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0023	0.0136	-0.0063	0.0149	0.0172	0.0287
Loan Div. (LD)	H3*S3	?	-0.0026	0.0024	-0.0049	0.0027 *	-0.0132	0.0057 **
Security Div. (SD)	H4*S4	?	0.0053	0.0017 ***	0.0024	0.0015 *	0.0078	0.0063
Non-interest-income Div. (NIID)	H5*S5	?	-1.1756	0.2798 ***	-1.3594	0.2613 ***	-0.5200	0.2529 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0014	0.0019	0.0006	0.0018	-0.0009	0.0052
Activity interaction								
DGD * LD	H2*H3	?	0.0056	0.0070	0.0095	0.0078	-0.0052	0.0094
DGD * NIID	H2*H5	?	-0.0002	0.0020	-0.0004	0.0018	0.0049	0.0075
SD * OBSD	H4*H6	?	-0.0001	0.0008	-0.0004	0.0008	0.0001	0.0035
All Activities	H2*H3*H4*H5*H6	?	0.0233	0.0228	0.0040	0.0236	0.2547	0.1061 **
Control variables								
International Loan Activity Dummy	ILAD							
Log Asset	C1	?	-0.0012	0.0003 ***	-0.0012	0.0003 ***	-0.0008	0.0009
Equity Ratio	C2	?	0.0268	0.0021 ***	0.0214	0.0020 ***	0.0395	0.0053 ***
Asset Growth	C3	+	0.0020	0.0008 **	0.0012	0.0008	0.0065	0.0027 **
Merger Dummy	C4	?	-0.0005	0.0004	0.0000	0.0003	-0.0023	0.0014 *
Merger * Asset Growth	C4*C3	?	-0.0019	0.0021	-0.0035	0.0020 *	0.0032	0.0058
Year 1999 Dummy	Y99		-0.0001	0.0002	0.0003	0.0001 *		
Year 2000 Dummy	Y00		-0.0002	0.0002	0.0003	0.0002		
Year 2001 Dummy	Y01		-0.0008	0.0004 **	-0.0001	0.0003		
Year 2002 Dummy	Y02		-0.0009	0.0004 **	-0.0002	0.0003		
Year 2003 Dummy	Y03		-0.0008	0.0004 *	-0.0001	0.0003		
Year 2004 Dummy	Y04		-0.0008	0.0004 *	-0.0001	0.0003		
Year 2005 Dummy	Y05		-0.0007	0.0004 *	-0.0001	0.0003		
Year 2006 Dummy	Y06		-0.0008	0.0004 *	0.0000	0.0003		
Year 2007 Dummy	Y07		-0.0012	0.0004 ***				
Year 2008 Dummy	Y08		-0.0020	0.0004 ***			-0.0011	0.0001 ***
First-order Coefficient of Autocorrelation	AR(1)		0.4614	0.0429 ***	0.4951	0.0556 ***	0.3412	0.0613 ***
Observations			7543		6071		1471	
Adjusted R-squared			0.3396		0.3717		0.2602	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

## Appendix 2: Risk Adjusted Return on Asset (RAROA) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROA	Std. Error	RAROA	Std. Error	RAROA	Std. Error
Activity diversification								
	C		12.7190	8.9922	-14.7828	9.0301	8.5951	14.3500
Domestic Geographic Div. (DGD)	H2	?	-6.3237	6.4769	-10.8857	8.5223	29.9899	40.7685
Loan Div. (LD)	H3	?	-5.4416	5.6348	0.2462	7.6022	7.2721	11.2648
Security Div. (SD)	H4	?	-1.5584	0.8291 *	-0.4448	1.0520	2.0284	3.6872
Non-interest-income Div. (NIID)	H5	?	0.3206	0.6167	1.0796	0.7479	3.3148	1.7623 *
Off-balance-sheet Div. (OBSD)	H6	?	-0.6703	1.1552	0.5290	1.0908	1.8444	3.8965
Scale variables								
Deposit Ratio	S2	+	0.2063	1.3751	1.6406	1.5664	7.2213	3.9906 *
Loan Ratio	S3	+	-2.2860	3.8660	4.6676	5.5690	3.0952	7.0291
Security Ratio	S4	+	-0.8281	2.4279	0.6197	2.5945	1.6154	7.5210
Non-interest-income Ratio	S5	?	85.8837	43.0996 **	75.3785	35.0958 **	195.4875	146.2303
Off-balance-sheet Ratio	S6	?	-1.6180	1.3074	-1.5020	1.5213	0.5533	4.0118
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	2.9999	6.2347	0.0429	7.2941	-56.2971	56.4407
Loan Div. (LD)	H3*S3	?	7.2467	7.9505	-4.5072	11.4305	-9.4308	15.2824
Security Div. (SD)	H4*S4	?	6.2233	3.9936	2.2765	4.9811	6.6018	12.8512
Non-interest-income Div. (NIID)	H5*S5	?	138.1351	122.7268	-24.4912	137.6013	-648.5177	344.9150 *
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.1104	2.7068	-1.3164	3.0575	-0.3054	10.0793
Activity interaction								
DGD * LD	H2*H3	?	-4.0849	11.3863	10.5295	17.2312	15.4813	20.8652
DGD * NIID	H2*H5	?	0.7125	4.8446	-5.1064	4.1727	-6.9074	7.9486
SD * OBSD	H4*H6	?	0.8174	1.7371	1.0489	1.8802	-3.5760	6.0242
All Activities	H2*H3*H4*H5*H6	?	48.6148	32.3456	38.5543	42.0060	191.3378	229.3557
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	-1.1859	1.5274	2.7545	1.4652 *	-2.9442	2.4020
Equity Ratio	C2	?	39.9014	7.5144 ***	34.6166	8.9621 ***	34.0422	11.1748 ***
Asset Growth	C3	+	0.0939	0.5982	-0.3109	0.6516	-1.3017	2.4738
Merger Dummy	C4	?	-0.1125	0.2849	-0.0556	0.3280	-0.8876	0.6758
Merger * Asset Growth	C4*C3	?	-2.3894	2.1028	-3.7341	2.5457	4.8227	3.7026
Year 1999 Dummy	Y99		-0.3696	0.1704 **	-0.1637	0.1714		
Year 2000 Dummy	Y00		-0.5850	0.2746 **	-0.2464	0.2753		
Year 2001 Dummy	Y01		-1.0073	0.6035 *	-1.1387	0.6226 *		
Year 2002 Dummy	Y02		-1.4522	0.6616 **	-1.4916	0.6674 **		
Year 2003 Dummy	Y03		-1.6883	0.7106 **	-1.6355	0.7083 **		
Year 2004 Dummy	Y04		-1.5350	0.7531 **	-1.4133	0.7401 *		
Year 2005 Dummy	Y05		-1.5629	0.7943 **	-1.3428	0.7740 *		
Year 2006 Dummy	Y06		-1.8222	0.8302 **	-1.4487	0.8047 *		
Year 2007 Dummy	Y07		-2.4663	0.8742 ***				
Year 2008 Dummy	Y08		-3.0169	0.9129 ***			-1.6297	0.2389 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8907	0.0111 ***	0.8900	0.0125 ***	0.7750	0.0280 ***
Observations			7543		6071		1471	
Adjusted R-squared			0.8012		0.8048		0.6246	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 3: Return on Equity (ROE) Regressions for Small BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROE	Std. Error	ROE	Std. Error	ROE	Std. Error
Activity diversification								
	C		0.0156	0.0336	0.0453	0.0245 *	-0.1837	0.0968 *
Domestic Geographic Div. (DGD)	H2	?	-0.0936	0.2170	0.0420	0.1840	-0.5649	0.6674
Loan Div. (LD)	H3	?	0.0244	0.0268	0.0274	0.0221	0.1641	0.0726 **
Security Div. (SD)	H4	?	-0.0157	0.0073 **	-0.0068	0.0053	-0.0234	0.0292
Non-interest-income Div. (NIID)	H5	?	0.0232	0.0060 ***	0.0260	0.0052 ***	0.0288	0.0168 *
Off-balance-sheet Div. (OBSD)	H6	?	-0.0031	0.0102	-0.0085	0.0095	0.0260	0.0403
Scale variables								
Deposit Ratio	S2	+	0.0333	0.0078 ***	0.0349	0.0063 ***	0.0103	0.0287
Loan Ratio	S3	+	0.0432	0.0209 **	0.0451	0.0165 ***	0.1622	0.0679 **
Security Ratio	S4	+	-0.0132	0.0165	0.0005	0.0132	0.0522	0.0723
Non-interest-income Ratio	S5	+	6.1131	1.2332 ***	6.7112	1.1082 ***	3.3756	3.3868
Off-balance-sheet Ratio	S6	?	0.0236	0.0073 ***	0.0178	0.0064 ***	0.0760	0.0349 **
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0124	0.2403	-0.1374	0.2351	0.4311	0.8128
Loan Div. (LD)	H3*S3	?	-0.0475	0.0413	-0.0732	0.0380 *	-0.1882	0.1046 *
Security Div. (SD)	H4*S4	?	0.0787	0.0275 ***	0.0200	0.0176	0.1360	0.0992
Non-interest-income Div. (NIID)	H5*S5	?	-10.7006	2.0723 ***	-12.2575	1.8820 ***	-7.3579	6.0233
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0001	0.0248	0.0061	0.0243	-0.0959	0.0870
Activity interaction								
DGD * LD	H2*H3	?	0.1874	0.1380	0.1263	0.1177	0.0201	0.2388
DGD * NIID	H2*H5	?	-0.0197	0.0347	0.0027	0.0259	0.0138	0.1913
SD * OBSD	H4*H6	?	-0.0004	0.0123	-0.0052	0.0115	0.0090	0.0484
All Activities	H2*H3*H4*H5*H6	?	0.3460	0.4651	-0.2956	0.4076	7.5138	2.8672 ***
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	-0.0099	0.0053 *	-0.0130	0.0048 ***	-0.0024	0.0119
Equity Ratio	C2	?	0.1085	0.0686	-0.0507	0.0417	0.5148	0.2075 **
Asset Growth	C3	+	0.0416	0.0145 ***	0.0185	0.0127	0.1708	0.0634 ***
Merger Dummy	C4	?	-0.0108	0.0083	-0.0010	0.0030	-0.0466	0.0275 *
Merger * Asset Growth	C4*C3	?	-0.0129	0.0409	-0.0340	0.0241	0.0423	0.1455
Year 1999 Dummy	Y99		-0.0012	0.0025	0.0036	0.0017 **		
Year 2000 Dummy	Y00		-0.0030	0.0029	0.0031	0.0020		
Year 2001 Dummy	Y01		-0.0065	0.0050	0.0004	0.0039		
Year 2002 Dummy	Y02		-0.0083	0.0055	-0.0013	0.0046		
Year 2003 Dummy	Y03		-0.0065	0.0054	0.0008	0.0044		
Year 2004 Dummy	Y04		-0.0060	0.0052	0.0013	0.0039		
Year 2005 Dummy	Y05		-0.0051	0.0051	0.0019	0.0040		
Year 2006 Dummy	Y06		-0.0058	0.0050	0.0022	0.0039		
Year 2007 Dummy	Y07		-0.0114	0.0051 **				
Year 2008 Dummy	Y08		-0.0245	0.0054 ***			-0.0168	0.0027 ***
First-order Coefficient of Autocorrelation	AR(1)		0.4271	0.1142 ***	0.4650	0.1247 ***	0.3298	0.1616 **
Observations			7543		6071		1471	
Adjusted R-squared			0.2390		0.2689		0.2259	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

#### Appendix 4: Risk Adjusted Return on Equity (RAROE) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROE	Std. Error	RAROE	Std. Error	RAROE	Std. Error
Activity diversification								
	C		18.6618	9.0282 **	-8.8367	9.5121	10.3650	13.2804
Domestic Geographic Div. (DGD)	H2	?	-9.9078	6.1603	-14.2084	7.3151 *	-8.6789	29.2632
Loan Div. (LD)	H3	?	-6.5806	5.4184	-1.7305	7.2830	7.3975	8.4462
Security Div. (SD)	H4	?	-1.4671	0.8524 *	-0.3525	1.0941	1.0344	3.2349
Non-interest-income Div. (NIID)	H5	?	0.3621	0.6395	1.2328	0.7611	3.2811	1.6386 **
Off-balance-sheet Div. (OBSD)	H6	?	-1.2937	1.2708	-0.4526	1.2281	0.3494	3.5467
Scale variables								
Deposit Ratio	S2	+	-1.2078	1.3477	-0.5540	1.5694	3.8706	3.4227
Loan Ratio	S3	+	-5.0978	3.6208	1.7824	5.3022	3.0650	5.9661
Security Ratio	S4	+	-1.5769	2.5901	0.2319	2.7574	-0.4311	6.9291
Non-interest-income Ratio	S5	?	77.7551	40.7394 *	68.7041	31.8454 **	207.8954	139.6414
Off-balance-sheet Ratio	S6	?	-1.4089	1.4016	-1.5350	1.7242	-0.0038	3.7992
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	6.2758	6.4896	3.5594	7.5896	-4.5398	38.6454
Loan Div. (LD)	H3*S3	?	9.1994	7.5983	-0.9553	10.8528	-10.5203	11.6002
Security Div. (SD)	H4*S4	?	5.9958	4.0035	2.0057	4.9849	9.2981	11.4484
Non-interest-income Div. (NIID)	H5*S5	?	199.0415	125.0654	30.6209	141.2071	-689.7074	331.6121 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.4633	2.9531	-1.7827	3.4711	2.0866	9.4222
Activity interaction								
DGD * LD	H2*H3	?	2.3160	9.3173	12.7371	12.3883	10.2898	16.2680
DGD * NIID	H2*H5	?	-3.3554	3.0247	-6.0971	3.9697	-5.6019	6.5150
SD * OBSD	H4*H6	?	1.7185	1.8554	2.6113	2.0445	-2.4176	5.4049
All Activities	H2*H3*H4*H5*H6	?	40.7556	31.7713	16.2227	40.5033	270.1002	178.8307
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	-1.4796	1.5607	2.5845	1.5422 *	-2.6243	2.1792
Equity Ratio	C2	?	25.0175	7.2513 ***	20.7264	8.5562 **	31.3346	9.8189 ***
Asset Growth	C3	+	1.1188	0.6023 *	0.5521	0.6541	1.0440	2.4207
Merger Dummy	C4	?	-0.0409	0.3631	-0.0247	0.4301	-0.6756	0.7010
Merger * Asset Growth	C4*C3	?	-2.7564	2.0504	-4.0382	2.4624	4.3211	3.5770
Year 1999 Dummy	Y99		-0.4250	0.1762 **	-0.2512	0.1729		
Year 2000 Dummy	Y00		-0.6102	0.2740 **	-0.3347	0.2646		
Year 2001 Dummy	Y01		-1.0934	0.6639 *	-1.4488	0.6643 **		
Year 2002 Dummy	Y02		-1.3465	0.7228 *	-1.6437	0.7089 **		
Year 2003 Dummy	Y03		-1.5534	0.7728 **	-1.7922	0.7451 **		
Year 2004 Dummy	Y04		-1.4320	0.8149 *	-1.6346	0.7745 **		
Year 2005 Dummy	Y05		-1.3865	0.8528	-1.5187	0.8039 *		
Year 2006 Dummy	Y06		-1.6870	0.8884 *	-1.6988	0.8317 **		
Year 2007 Dummy	Y07		-2.4649	0.9332 ***				
Year 2008 Dummy	Y08		-2.9116	0.9697 ***			-1.4228	0.2314 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8778	0.0107 ***	0.8794	0.0116 ***	0.7527	0.0302 ***
Observations			7543		6071		1471	
Adjusted R-squared			0.7796		0.7866		0.5934	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 5: Stock Return (SR) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			SR	Std. Error	SR	Std. Error	SR	Std. Error
Activity diversification								
	C		-0.2605	0.2011	-0.2438	0.1573	-2.4839	0.9315 ***
Domestic Geographic Div. (DGD)	H2	?	-0.2112	1.0227	-0.6424	1.0325	9.8575	18.9870
Loan Div. (LD)	H3	?	0.0302	0.1354	0.0453	0.1157	0.7011	0.7257
Security Div. (SD)	H4	?	0.0556	0.0374	0.0426	0.0312	0.0545	0.1629
Non-interest-income Div. (NIID)	H5	?	-0.0642	0.0343 *	-0.0153	0.0292	0.1823	0.1976
Off-balance-sheet Div. (OBSD)	H6	?	0.0744	0.0585	0.0428	0.0613	-0.0806	0.4297
Scale variables								
Deposit Ratio	S2	+	0.1466	0.0608 **	0.1050	0.0525 **	0.5134	0.2837 *
Loan Ratio	S3	+	0.0625	0.1034	0.1245	0.0892	0.2974	0.5978
Security Ratio	S4	+	0.1878	0.0820 **	0.0763	0.0755	1.1969	0.8150
Non-interest-income Ratio	S5	+	-15.9845	5.5871 ***	3.8470	5.2485	-6.5712	17.5734
Off-balance-sheet Ratio	S6	?	0.0991	0.0773	-0.0074	0.0655	0.5969	0.3179 *
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.7792	1.4167	1.0750	1.4218	-12.3913	21.4106
Loan Div. (LD)	H3*S3	?	-0.0441	0.1979	-0.1315	0.1664	-0.9029	0.9813
Security Div. (SD)	H4*S4	?	-0.1871	0.1235	-0.1185	0.1063	-0.8437	1.0274
Non-interest-income Div. (NIID)	H5*S5	?	40.2470	11.5143 ***	-5.9629	10.7402	50.7167	39.2370
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.4783	0.2321 **	-0.2190	0.2515	-0.8873	0.8467
Activity interaction								
DGD * LD	H2*H3	?	-0.5875	0.5818	-0.3806	0.5956	2.1968	7.3645
DGD * NIID	H2*H5	?	-0.3956	0.2654	-0.2635	0.2689	0.4498	8.4608
SD * OBSD	H4*H6	?	0.0587	0.0859	0.0266	0.0810	0.3906	0.7263
All Activities	H2*H3*H4*H5*H6	?	2.4353	2.6719	3.4718	2.5200	-28.3685	34.7414
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	0.0140	0.0255	0.0167	0.0198	0.2007	0.0865 **
Equity Ratio	C2	?	0.0360	0.2427	-0.0399	0.2016	1.0104	1.0069
Asset Growth	C3	+	0.2940	0.1094 ***	0.2632	0.1057 **	0.2129	0.3616
Merger Dummy	C4	?	0.0204	0.0219	0.0289	0.0208	0.1744	0.1623
Merger * Asset Growth	C4*C3	?	-0.4252	0.1344 ***	-0.4459	0.1251 ***	-0.4586	0.4489
Year 1999 Dummy	Y99		-0.0257	0.0211	-0.0382	0.0206 *		
Year 2000 Dummy	Y00		-0.0122	0.0222	-0.0212	0.0219		
Year 2001 Dummy	Y01		0.0528	0.0304 *	0.0682	0.0288 **		
Year 2002 Dummy	Y02		0.0197	0.0297	0.0347	0.0282		
Year 2003 Dummy	Y03		0.0400	0.0298	0.0602	0.0280 **		
Year 2004 Dummy	Y04		-0.0097	0.0296	0.0037	0.0283		
Year 2005 Dummy	Y05		-0.0404	0.0295	-0.0255	0.0276		
Year 2006 Dummy	Y06		-0.0068	0.0287	0.0042	0.0276		
Year 2007 Dummy	Y07		-0.1068	0.0295 ***				
Year 2008 Dummy	Y08		-0.1191	0.0416 ***			0.0107	0.0288
First-order Coefficient of Autocorrelation	AR(1)		-0.1064	0.0486 **	-0.1634	0.0405 ***	-0.1554	0.0705 **
Observations			1229		989		239	
Adjusted R-squared			0.1468		0.1401		0.0581	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 6: Risk Adjusted Stock Return (RASR) Regressions for Small BHCs

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	RASR	Std. Error	RASR	Std. Error	RASR	Std. Error
Activity diversification								
	C		-1.3541	1.2485	-1.3600	1.2259	-14.0544	5.9001 **
Domestic Geographic Div. (DGD)	H2	?	-1.6791	7.4153	-3.4548	7.7901	48.9902	44.8609
Loan Div. (LD)	H3	?	0.0776	0.9353	0.2062	0.9033	2.7686	4.4057
Security Div. (SD)	H4	?	0.5725	0.2433 **	0.7162	0.2491 ***	0.3841	0.9423
Non-interest-income Div. (NIID)	H5	?	-0.5936	0.2273 ***	-0.3902	0.2281 *	-0.1688	1.1445
Off-balance-sheet Div. (OBSD)	H6	?	0.3135	0.4091	0.2175	0.4544	-1.9884	2.1427
Scale variables								
Deposit Ratio	S2	+	1.0793	0.4228 **	0.9284	0.4422 **	2.6868	1.6616
Loan Ratio	S3	+	0.6267	0.6431	0.6711	0.6275	5.2855	3.5529
Security Ratio	S4	+	1.6181	0.6003 ***	1.0145	0.5969 *	11.8164	5.2997 **
Non-interest-income Ratio	S5	?	-55.8895	29.0314 *	12.3812	41.8230	-24.0508	72.4500
Off-balance-sheet Ratio	S6	?	0.5230	0.4616	0.1892	0.4649	1.7464	1.8774
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	8.4741	10.4010	10.7513	10.8456	-71.5107	42.4029 *
Loan Div. (LD)	H3*S3	?	-0.1228	1.3262	-0.5890	1.2890	-3.2512	5.7352
Security Div. (SD)	H4*S4	?	-1.4242	0.8772	-1.5439	0.8820 *	-7.0710	6.1846
Non-interest-income Div. (NIID)	H5*S5	?	182.2321	67.7149 ***	20.5862	85.8351	266.1284	197.7531
Off-balance-sheet Div. (OBSD)	H6*S6	?	-2.7247	1.6881	-1.5108	1.8745	-2.8477	4.8455
Activity interaction								
DGD * LD	H2*H3	?	-8.8037	4.2537 **	-9.4214	4.4685 **	17.4652	14.6917
DGD * NIID	H2*H5	?	-1.5998	2.0870	-1.6603	2.2524	14.4173	23.2496
SD * OBSD	H4*H6	?	0.3575	0.6106	0.1703	0.6084	3.8834	3.8311
All Activities	H2*H3*H4*H5*H6	?	-1.2711	22.2675	2.0194	23.1482	-163.8264	79.4715 **
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	0.0060	0.1607	0.0423	0.1567	0.7774	0.5419
Equity Ratio	C2	?	-0.4516	1.4116	-0.1593	1.3386	3.0364	7.2513
Asset Growth	C3	+	1.2769	0.6817 *	1.1678	0.6932 *	1.7074	1.9566
Merger Dummy	C4	?	0.1776	0.1917	0.1680	0.2195	1.3050	1.0110
Merger * Asset Growth	C4*C3	?	-2.4228	0.8817 ***	-2.3520	1.1915 **	-3.8153	2.2844 *
Year 1999 Dummy	Y99		-0.1788	0.1537	-0.2462	0.1535		
Year 2000 Dummy	Y00		-0.1068	0.1628	-0.1609	0.1632		
Year 2001 Dummy	Y01		0.3623	0.2079 *	0.3724	0.2096 *		
Year 2002 Dummy	Y02		0.1369	0.2081	0.1574	0.2105		
Year 2003 Dummy	Y03		0.3482	0.2084 *	0.3848	0.2103 *		
Year 2004 Dummy	Y04		-0.0397	0.2093	-0.0254	0.2111		
Year 2005 Dummy	Y05		-0.2887	0.2092	-0.2862	0.2084		
Year 2006 Dummy	Y06		0.0565	0.2082	0.0471	0.2110		
Year 2007 Dummy	Y07		-0.9784	0.2132 ***				
Year 2008 Dummy	Y08		-0.9261	0.2493 ***			0.1315	0.1880
First-order Coefficient of Autocorrelation	AR(1)		-0.1219	0.0345 ***	-0.1300	0.0350 ***	-0.1829	0.0771 **
Observations			1229		989		239	
Adjusted R-squared			0.2021		0.1361		0.0101	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



# Appendix 7: Net Charge Off (NCO) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			NCO	Std. Error	NCO	Std. Error	NCO	Std. Error
Activity diversification								
	C		-0.0036	0.0009 ***	-0.0033	0.0009 ***	0.0025	0.0028
Domestic Geographic Div. (DGD)	H2	?	-0.0012	0.0045	-0.0018	0.0050	0.0058	0.0063
Loan Div. (LD)	H3	?	0.0007	0.0007	-0.0001	0.0004	-0.0009	0.0024
Security Div. (SD)	H4	?	0.0002	0.0003	-0.0002	0.0002	0.0018	0.0011 *
Non-interest-income Div. (NIID)	H5	?	-0.0005	0.0001 ***	-0.0005	0.0001 ***	-0.0019	0.0007 **
Off-balance-sheet Div. (OBSD)	H6	?	0.0015	0.0005 ***	0.0012	0.0004 ***	0.0024	0.0019
Scale variables								
Deposit Ratio	S2	-	0.0004	0.0002	0.0001	0.0002	0.0009	0.0009
Loan Ratio	S3	?	0.0001	0.0005	-0.0003	0.0003	-0.0026	0.0021
Security Ratio	S4	?	-0.0008	0.0004 *	-0.0009	0.0004 **	-0.0020	0.0023
Non-interest-income Ratio	S5	?	0.0140	0.0302	0.0233	0.0349	-0.1407	0.0655 **
Off-balance-sheet Ratio	S6	?	-0.0005	0.0002 **	-0.0003	0.0002	-0.0025	0.0011 **
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0034	0.0060	0.0039	0.0066	-0.0055	0.0090
Loan Div. (LD)	H3*S3	?	-0.0005	0.0011	0.0012	0.0007 *	0.0007	0.0036
Security Div. (SD)	H4*S4	?	-0.0009	0.0007	0.0006	0.0006	-0.0058	0.0029 **
Non-interest-income Div. (NIID)	H5*S5	?	-0.0014	0.0603	0.0218	0.0696	0.2326	0.1292 *
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0023	0.0013 *	-0.0021	0.0012 *	0.0007	0.0043
Activity interaction								
DGD * LD	H2*H3	?	-0.0031	0.0030	-0.0026	0.0033	-0.0034	0.0076
DGD * NIID	H2*H5	?	0.0008	0.0009	0.0008	0.0009	0.0045	0.0048
SD * OBSD	H4*H6	?	-0.0014	0.0005 ***	-0.0009	0.0005 **	-0.0042	0.0021 **
All Activities	H2*H3*H4*H5*H6	?	-0.0123	0.0157	-0.0028	0.0158	-0.1171	0.0592 **
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	0.0007	0.0002 ***	0.0007	0.0002 ***	0.0002	0.0005
Equity Ratio	C2	?	-0.0025	0.0009 ***	-0.0010	0.0009	-0.0066	0.0027 **
Asset Growth	C3	+	-0.0020	0.0004 ***	-0.0015	0.0004 ***	-0.0045	0.0016 ***
Merger Dummy	C4	?	0.0002	0.0004	-0.0002	0.0001 *	0.0016	0.0014
Merger * Asset Growth	C4*C3	?	0.0015	0.0015	0.0028	0.0008 ***	-0.0041	0.0057
Year 1999 Dummy	Y99		-0.0001	0.0001	-0.0002	0.0001 ***		
Year 2000 Dummy	Y00		-0.0001	0.0001	-0.0002	0.0001 ***		
Year 2001 Dummy	Y01		0.0003	0.0002 **	0.0002	0.0001		
Year 2002 Dummy	Y02		0.0004	0.0002 **	0.0002	0.0001		
Year 2003 Dummy	Y03		0.0004	0.0002 **	0.0002	0.0001		
Year 2004 Dummy	Y04		0.0004	0.0002 **	0.0002	0.0001		
Year 2005 Dummy	Y05		0.0001	0.0002	0.0000	0.0001		
Year 2006 Dummy	Y06		0.0001	0.0002	-0.0001	0.0001		
Year 2007 Dummy	Y07		0.0003	0.0002 ***				
Year 2008 Dummy	Y08		0.0009	0.0002 ***			0.0006	0.0001 ***
First-order Coefficient of Autocorrelation	AR(1)		0.2503	0.0355 ***	0.2363	0.0400 ***	0.2057	0.0581 ***
Observations			7543		6071		1471	
Adjusted R-squared			0.1288		0.1164		0.1292	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 8: Maturity Gap (MG) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MG	Std. Error	MG	Std. Error	MG	Std. Error
Activity diversification								
	C		-0.1660	0.1665	-0.0894	0.1884	0.2201	0.3310
Domestic Geographic Div. (DGD)	H2	?	-0.1484	0.1539	-0.1689	0.1731	1.1787	0.6274 *
Loan Div. (LD)	H3	?	0.2695	0.1419 *	0.2275	0.1524	-0.0704	0.2236
Security Div. (SD)	H4	?	0.0283	0.0287	-0.0131	0.0304	0.1767	0.0717 **
Non-interest-income Div. (NIID)	H5	?	0.0048	0.0172	-0.0153	0.0196	0.0584	0.0524
Off-balance-sheet Div. (OBSD)	H6	?	-0.0450	0.0352	-0.0208	0.0383	0.0973	0.0853
Scale variables								
Deposit Ratio	S2	-	-0.0889	0.0445 **	-0.0933	0.0536 *	-0.1154	0.0710
Loan Ratio	S3	?	0.1010	0.0881	0.0383	0.0984	-0.2048	0.1791
Security Ratio	S4	?	-0.0232	0.0640	-0.0542	0.0708	0.0122	0.1804
Non-interest-income Ratio	S5	?	0.3214	0.9474	0.0612	0.9502	-0.3266	5.7087
Off-balance-sheet Ratio	S6	?	0.0740	0.0394 *	0.1242	0.0462 ***	0.1321	0.1088
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.2335	0.1671	0.1293	0.1710	-1.8348	0.7997 **
Loan Div. (LD)	H3*S3	?	-0.3913	0.2030 *	-0.2936	0.2235	0.0015	0.3247
Security Div. (SD)	H4*S4	?	-0.2125	0.1136 *	-0.1106	0.1253	-0.6044	0.2537 **
Non-interest-income Div. (NIID)	H5*S5	?	1.0023	3.7207	6.4371	4.3914	4.9635	12.2079
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0909	0.0847	-0.1794	0.1063 *	-0.0715	0.2369
Activity interaction								
DGD * LD	H2*H3	?	-0.0614	0.2118	0.0793	0.2399	0.9353	0.3387 ***
DGD * NIID	H2*H5	?	0.0344	0.0957	0.0886	0.1132	0.0261	0.2162
SD * OBSD	H4*H6	?	0.0867	0.0544	0.0891	0.0617	-0.1679	0.1338
All Activities	H2*H3*H4*H5*H6	?	-1.6299	1.2251	-1.7284	1.3279	-1.7229	3.2826
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	0.0530	0.0268 **	0.0431	0.0298	0.0080	0.0514
Equity Ratio	C2	?	0.0526	0.1609	0.1394	0.1737	0.3631	0.2616
Asset Growth	C3	+	0.0258	0.0191	0.0341	0.0210	-0.0227	0.0517
Merger Dummy	C4	?	-0.0045	0.0077	-0.0139	0.0100	0.0091	0.0091
Merger * Asset Growth	C4*C3	?	-0.0397	0.0369	-0.0267	0.0440	0.0063	0.0764
Year 1999 Dummy	Y99		-0.0081	0.0053	-0.0075	0.0054		
Year 2000 Dummy	Y00		-0.0130	0.0072 *	-0.0122	0.0074 *		
Year 2001 Dummy	Y01		0.0097	0.0159	0.0274	0.0180		
Year 2002 Dummy	Y02		0.0051	0.0163	0.0238	0.0186		
Year 2003 Dummy	Y03		0.0140	0.0167	0.0331	0.0190 *		
Year 2004 Dummy	Y04		0.0165	0.0169	0.0363	0.0193 *		
Year 2005 Dummy	Y05		0.0121	0.0170	0.0329	0.0195 *		
Year 2006 Dummy	Y06		0.0032	0.0170	0.0245	0.0194		
Year 2007 Dummy	Y07		-0.0126	0.0175				
Year 2008 Dummy	Y08		-0.0167	0.0172			-0.0033	0.0056
First-order Coefficient of Autocorrelation	AR(1)		0.8278	0.0106 ***	0.8121	0.0128 ***	0.7766	0.0220 ***
Observations			7543		6071		1471	
Adjusted R-squared			0.6972		0.6788		0.6201	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 9: Derivatives Loss (DL) Regressions for Small BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			DL	Std. Error	DL	Std. Error	DL	Std. Error
Activity diversification								
	C		0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Domestic Geographic Div. (DGD)	H2	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
Loan Div. (LD)	H3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Security Div. (SD)	H4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Non-interest-income Div. (NIID)	H5	?	0.0000	0.0000	0.0000	0.0000 ***	0.0000	0.0000
Off-balance-sheet Div. (OBSD)	H6	?	0.0000	0.0000 ***	0.0000	0.0000	-0.0001	0.0000 ***
Scale variables								
Deposit Ratio	S2	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Loan Ratio	S3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Security Ratio	S4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Non-interest-income Ratio	S5	?	0.0000	0.0003	0.0000	0.0000	0.0026	0.0019
Off-balance-sheet Ratio	S6	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0000	0.0001	0.0000	0.0000	0.0000	0.0003
Loan Div. (LD)	H3*S3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Security Div. (SD)	H4*S4	?	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
Non-interest-income Div. (NIID)	H5*S5	?	0.0007	0.0007	0.0000	0.0000	-0.0037	0.0040
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0001	0.0000 ***	0.0000	0.0000 ***	0.0003	0.0001 ***
Activity interaction								
DGD * LD	H2*H3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
DGD * NIID	H2*H5	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
SD * OBSD	H4*H6	?	0.0000	0.0000 ***	0.0000	0.0000	0.0001	0.0001 ***
All Activities	H2*H3*H4*H5*H6	?	-0.0002	0.0002	0.0000	0.0000	-0.0004	0.0014
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Equity Ratio	C2	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Asset Growth	C3	+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger Dummy	C4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger * Asset Growth	C4*C3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Year 1999 Dummy	Y99		0.0000	0.0000	0.0000	0.0000		
Year 2000 Dummy	Y00		0.0000	0.0000	0.0000	0.0000		
Year 2001 Dummy	Y01		0.0000	0.0000	0.0000	0.0000		
Year 2002 Dummy	Y02		0.0000	0.0000	0.0000	0.0000		
Year 2003 Dummy	Y03		0.0000	0.0000	0.0000	0.0000		
Year 2004 Dummy	Y04		0.0000	0.0000	0.0000	0.0000		
Year 2005 Dummy	Y05		0.0000	0.0000	0.0000	0.0000		
Year 2006 Dummy	Y06		0.0000	0.0000	0.0000	0.0000 *		
Year 2007 Dummy	Y07		0.0000	0.0000				
Year 2008 Dummy	Y08		0.0000	0.0000			0.0000	0.0000
First-order Coefficient of Autocorrelation	AR(1)		0.0523	0.0115 ***	0.0909	0.0129 ***	0.0488	0.0264 *
Observations			7543		6071		1471	
Adjusted R-squared			0.0050		0.0135		0.0078	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 10: Market Beta (MB) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MB	Std. Error	MB	Std. Error	MB	Std. Error
Activity diversification								
	C		-6.2748	2.1400 ***	-5.8578	1.8868 ***	-19.1655	3.5129 ***
Domestic Geographic Div. (DGD)	H2	?	0.0459	1.5297	3.3936	2.5367	22.9011	16.8362
Loan Div. (LD)	H3	?	0.2168	0.7976	-0.2245	1.0479	0.9617	1.9819
Security Div. (SD)	H4	?	-0.0335	0.0738	0.1121	0.0924	0.7266	0.3861 *
Non-interest-income Div. (NIID)	H5	?	-0.0723	0.1410	-0.1942	0.1696	-0.0889	0.4346
Off-balance-sheet Div. (OBSD)	H6	?	0.6332	0.2022 ***	0.5493	0.2179 **	1.1677	0.7164
Scale variables								
Deposit Ratio	S2	-	-0.0652	0.1756	-0.1402	0.2497	0.1647	0.6472
Loan Ratio	S3	?	0.3554	0.4913	-0.1621	0.5657	1.0392	1.4259
Security Ratio	S4	?	-0.0210	0.1655	-0.3476	0.2030 *	0.8793	1.3822
Non-interest-income Ratio	S5	?	-24.7340	16.8684	-33.5986	26.9343	-30.5414	22.6229
Off-balance-sheet Ratio	S6	?	0.7643	0.3653 **	0.6039	0.3138 *	1.0326	0.9247
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	1.0939	1.7199	0.7196	1.9358	-1.4162	18.5211
Loan Div. (LD)	H3*S3	?	-0.1043	1.2971	0.7242	1.4970	-1.8367	2.8042
Security Div. (SD)	H4*S4	?	0.2261	0.3127	0.8267	0.5280	-0.1801	1.6467
Non-interest-income Div. (NIID)	H5*S5	?	40.7016	30.5889	64.9820	45.3920	130.0089	77.1557 *
Off-balance-sheet Div. (OBSD)	H6*S6	?	-1.6673	0.6373 ***	-1.1921	0.6784 *	-0.2230	2.3826
Activity interaction								
DGD * LD	H2*H3	?	-2.2909	1.5410	-8.2242	3.7607 **	-31.0488	4.8976 ***
DGD * NIID	H2*H5	?	0.0493	0.9741	-0.1318	1.3772	-12.0160	5.9761 **
SD * OBSD	H4*H6	?	-0.6017	0.2835 **	-0.7211	0.2693 ***	-2.6123	1.1560 **
All Activities	H2*H3*H4*H5*H6	?	1.6263	5.2766	8.7153	8.1456	47.3209	24.4690 *
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	0.9978	0.3179 ***	0.9716	0.2772 ***	2.9321	0.4096 ***
Equity Ratio	C2	?	3.2650	1.1125 ***	4.0714	1.2126 ***	6.3856	2.1813 ***
Asset Growth	C3	+	-0.0920	0.1084	-0.0498	0.0901	-1.0019	0.4315 **
Merger Dummy	C4	?	0.0066	0.0165	0.0350	0.0324	0.1166	0.1115
Merger * Asset Growth	C4*C3	?	-0.0709	0.1059	-0.1938	0.1692	0.3868	0.5254
Year 1999 Dummy	Y99		-0.0031	0.0158	0.0104	0.0215		
Year 2000 Dummy	Y00		0.0006	0.0271	0.0247	0.0367		
Year 2001 Dummy	Y01		-0.0028	0.0570	-0.0015	0.0663		
Year 2002 Dummy	Y02		0.0137	0.0629	0.0265	0.0732		
Year 2003 Dummy	Y03		0.0172	0.0696	0.0515	0.0817		
Year 2004 Dummy	Y04		0.0318	0.0812	0.0738	0.0899		
Year 2005 Dummy	Y05		0.0621	0.0917	0.1217	0.0979		
Year 2006 Dummy	Y06		0.1987	0.1029 *	0.2861	0.1045 ***		
Year 2007 Dummy	Y07		0.1954	0.1130 *				
Year 2008 Dummy	Y08		0.1695	0.1212			-0.1063	0.0508 **
First-order Coefficient of Autocorrelation	AR(1)		0.9427	0.0173 ***	0.8934	0.0357 ***	0.9095	0.0293 ***
Observations			1229		989		239	
Adjusted R-squared			0.9388		0.8922		0.8932	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 11: Interest Rate Beta (IRB) Regressions for Small BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			IRB	Std. Error	IRB	Std. Error	IRB	Std. Error
Activity diversification								
	C		1.6976	0.7022 **	1.0828	0.3252 ***	1.9279	1.3341
Domestic Geographic Div. (DGD)	H2	?	-0.7605	1.0592	-0.2158	0.7947	-17.0736	9.0531 *
Loan Div. (LD)	H3	?	0.3145	0.3988	-0.1900	0.3400	0.7538	1.0336
Security Div. (SD)	H4	?	0.0323	0.0497	0.0218	0.0392	0.0932	0.2513
Non-interest-income Div. (NIID)	H5	?	0.0403	0.0825	-0.0089	0.0498	-0.0786	0.2490
Off-balance-sheet Div. (OBSD)	H6	?	-0.1934	0.1385	0.0402	0.0883	-0.5013	0.4118
Scale variables								
Deposit Ratio	S2	-	-0.0397	0.1290	-0.1444	0.0901	0.1011	0.3659
Loan Ratio	S3	?	0.1663	0.2269	-0.2089	0.2693	0.1195	0.6436
Security Ratio	S4	?	-0.1488	0.1583	0.0674	0.0716	-0.3404	0.9326
Non-interest-income Ratio	S5	?	4.5863	8.3928	-9.9686	9.4365	-13.5460	13.6731
Off-balance-sheet Ratio	S6	?	-0.4133	0.2002 **	-0.3559	0.1510 **	-0.6874	0.4298
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.8315	1.2392	0.2223	0.8277	21.2335	10.5082 **
Loan Div. (LD)	H3*S3	?	-0.9022	0.5932	0.2945	0.5454	-1.5624	1.4234
Security Div. (SD)	H4*S4	?	-0.1327	0.2701	-0.1400	0.1571	-0.2193	1.0849
Non-interest-income Div. (NIID)	H5*S5	?	-9.6198	14.9949	20.8691	15.5812	5.7061	35.9686
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.4878	0.4668	0.3579	0.3429	2.2531	1.0059 **
Activity interaction								
DGD * LD	H2*H3	?	0.8746	1.2296	0.2570	0.9330	-2.3806	3.2171
DGD * NIID	H2*H5	?	-0.8298	0.4864 *	0.0581	0.3575	-0.2152	3.6075
SD * OBSD	H4*H6	?	0.2851	0.2070	-0.0903	0.1070	0.3650	0.6836
All Activities	H2*H3*H4*H5*H6	?	-1.4321	4.4112	-0.8464	3.7049	12.9869	11.9908
Control variables								
International Loan Activity Dummy	ILAD	+						
Log Asset	C1	?	-0.2221	0.1056 **	-0.1187	0.0452 ***	-0.2219	0.1552
Equity Ratio	C2	?	-1.9835	0.5483 ***	0.3827	0.3158	-4.5638	1.6512 ***
Asset Growth	C3	+	-0.1107	0.0582 *	-0.0303	0.0407	-0.1793	0.2539
Merger Dummy	C4	?	-0.0093	0.0140	0.0188	0.0164	-0.0712	0.0387 *
Merger * Asset Growth	C4*C3	?	0.1351	0.0677 **	-0.0450	0.0840	0.2655	0.2522
Year 1999 Dummy	Y99		-0.0105	0.0167	-0.0151	0.0092 *		
Year 2000 Dummy	Y00		-0.0663	0.0269 **	-0.0733	0.0148 ***		
Year 2001 Dummy	Y01		-0.1134	0.0525 **	-0.1468	0.0272 ***		
Year 2002 Dummy	Y02		-0.1395	0.0574 **	-0.1781	0.0302 ***		
Year 2003 Dummy	Y03		-0.0705	0.0638	-0.1200	0.0320 ***		
Year 2004 Dummy	Y04		-0.0908	0.0669	-0.1460	0.0331 ***		
Year 2005 Dummy	Y05		-0.1206	0.0713 *	-0.1670	0.0350 ***		
Year 2006 Dummy	Y06		-0.0641	0.0747	-0.1115	0.0352 ***		
Year 2007 Dummy	Y07		-0.0627	0.0784				
Year 2008 Dummy	Y08		-0.0942	0.0795			-0.0173	0.0332
First-order Coefficient of Autocorrelation	AR(1)		0.8054	0.0263 ***	0.8435	0.0239 ***	0.6659	0.0618 ***
Observations			1229		989		239	
Adjusted R-squared			0.6312		0.7445		0.4547	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 12: Distance to Default (Z-Score) Regressions for Small BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			Z	Std. Error	Z	Std. Error	Z	Std. Error
Activity diversification								
	C		119.26	276.90	-689.75	270.83 **	195.21	492.75
Domestic Geographic Div. (DGD)	H2	?	-123.90	126.02	-218.05	196.50	710.72	1268.47
Loan Div. (LD)	H3	?	-195.23	167.75	-140.77	253.96	-24.71	326.95
Security Div. (SD)	H4	?	-29.10	22.72	3.01	29.93	191.56	123.07
Non-interest-income Div. (NIID)	H5	?	17.19	17.74	41.52	21.98 *	79.78	52.21
Off-balance-sheet Div. (OBSD)	H6	?	-22.77	29.12	22.99	26.79	77.13	116.98
Scale variables								
Deposit Ratio	S2	+	38.68	42.19	72.37	51.90	232.38	129.94 *
Loan Ratio	S3	?	-127.52	116.11	-15.65	177.82	-167.23	219.53
Security Ratio	S4	?	-87.08	73.56	-46.41	82.19	101.47	225.99
Non-interest-income Ratio	S5	?	-476.84	1154.28	-731.10	1144.26	-1112.80	5183.14
Off-balance-sheet Ratio	S6	?	-76.92	35.64 **	-92.22	41.53 **	-64.62	122.46
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	7.63	133.22	-51.19	177.52	-1318.93	1766.34
Loan Div. (LD)	H3*S3	?	286.72	238.39	133.37	370.54	116.80	458.38
Security Div. (SD)	H4*S4	?	231.80	115.38 **	194.65	157.68	-87.96	400.34
Non-interest-income Div. (NIID)	H5*S5	?	-2968.13	3291.78	-6023.98	4045.41	-16806.64	12444.86
Off-balance-sheet Div. (OBSD)	H6*S6	?	84.29	72.56	52.26	82.18	120.32	279.38
Activity interaction								
DGD * LD	H2*H3	?	-100.55	242.17	179.94	426.44	108.74	637.89
DGD * NIID	H2*H5	?	8.44	121.18	-185.56	105.09 *	-343.50	256.61
SD * OBSD	H4*H6	?	2.75	44.75	-33.18	48.39	-195.01	186.93
All Activities	H2*H3*H4*H5*H6	?	1105.41	607.14 *	1236.40	937.19	8079.45	6966.01
Control variables								
International Loan Activity Dummy	ILAD	-						
Log Asset	C1	?	3.93	47.27	129.49	46.17 ***	-59.51	82.84
Equity Ratio	C2	?	1917.94	231.02 ***	1948.70	263.55 ***	1885.22	370.85 ***
Asset Growth	C3	-	4.02	15.51	-7.71	16.87	-61.84	74.73
Merger Dummy	C4	?	0.88	5.51	4.52	5.99	-20.75	16.20
Merger * Asset Growth	C4*C3	?	-71.63	43.04 *	-104.54	52.44 **	119.77	107.40
Year 1999 Dummy	Y99		-6.60	3.93 *	-3.62	4.09		
Year 2000 Dummy	Y00		-10.37	6.76	-5.46	7.00		
Year 2001 Dummy	Y01		-13.34	17.15	-33.58	17.69 *		
Year 2002 Dummy	Y02		-27.88	18.83	-46.92	19.00 **		
Year 2003 Dummy	Y03		-35.95	20.37 *	-53.80	20.35 ***		
Year 2004 Dummy	Y04		-34.02	21.80	-50.82	21.51 **		
Year 2005 Dummy	Y05		-35.84	23.16	-50.66	22.73 **		
Year 2006 Dummy	Y06		-38.24	24.44	-50.35	23.78 **		
Year 2007 Dummy	Y07		-43.60	25.92 *				
Year 2008 Dummy	Y08		-56.15	27.34 **			-35.72	7.25 ***
First-order Coefficient of Autocorrelation	AR(1)		0.92	0.01 ***	0.92	0.01 ***	0.83	0.02 ***
Observations			7543		6071		1471	
Adjusted R-squared			0.8688		0.8586		0.7324	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

### Appendix 13: Return on Asset (ROA) Regressions for Larger Community BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROA	Std. Error	ROA	Std. Error	ROA	Std. Error
Activity diversification								
	C		-0.0084	0.0020 ***	-0.0093	0.0025 ***	-0.0159	0.0055 ***
Domestic Geographic Div. (DGD)	H2	?	-0.0218	0.0063 ***	-0.0173	0.0063 ***	-0.0281	0.0109 ***
Loan Div. (LD)	H3	?	0.0095	0.0042 **	0.0115	0.0049 **	0.0087	0.0052 *
Security Div. (SD)	H4	?	-0.0028	0.0007 ***	-0.0027	0.0009 ***	-0.0004	0.0015
Non-interest-income Div. (NIID)	H5	?	0.0036	0.0014 ***	0.0038	0.0013 ***	0.0033	0.0015 **
Off-balance-sheet Div. (OBSD)	H6	?	-0.0018	0.0008 **	-0.0005	0.0009	-0.0009	0.0024
Scale variables								
Deposit Ratio	S2	+	-0.0009	0.0013	-0.0021	0.0021	0.0013	0.0010
Loan Ratio	S3	+	0.0150	0.0035 ***	0.0150	0.0037 ***	0.0182	0.0059 ***
Security Ratio	S4	+	0.0057	0.0012 ***	0.0037	0.0015 **	0.0195	0.0046 ***
Non-interest-income Ratio	S5	+	0.4693	0.1194 ***	0.5504	0.1096 ***	0.2815	0.0835 ***
Off-balance-sheet Ratio	S6	?	-0.0001	0.0001	-0.0001	0.0002	0.0070	0.0015 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0190	0.0066 ***	0.0131	0.0080	0.0302	0.0111 ***
Loan Div. (LD)	H3*S3	?	-0.0143	0.0062 **	-0.0178	0.0071 **	-0.0093	0.0073
Security Div. (SD)	H4*S4	?	0.0060	0.0018 ***	0.0057	0.0026 **	0.0021	0.0051
Non-interest-income Div. (NIID)	H5*S5	?	-0.3614	0.2228	-0.3337	0.1720 *	-0.1537	0.2232
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0001	0.0008	-0.0010	0.0013	-0.0071	0.0032 **
Activity interaction								
DGD * LD	H2*H3	+	0.0052	0.0039	0.0076	0.0050	-0.0054	0.0079
DGD * NIID	H2*H5	+	0.0077	0.0026 ***	0.0043	0.0027	0.0132	0.0085
SD * OBSD	H4*H6	+	0.0017	0.0014	-0.0002	0.0016	0.0010	0.0038
All Activities	H2*H3*H4*H5*H6	+	-0.0113	0.0082	-0.0014	0.0100	-0.0278	0.0194
Control variables								
International Loan Activity Dummy	ILAD		0.0003	0.0004	-0.0013	0.0006 **	0.0028	0.0006 ***
Log Asset	C1	?	-0.0001	0.0002	0.0002	0.0002	-0.0011	0.0004 ***
Equity Ratio	C2	?	0.0246	0.0086 ***	0.0223	0.0157	0.0377	0.0069 ***
Asset Growth	C3	+	0.0001	0.0018	-0.0010	0.0015	0.0117	0.0029 ***
Merger Dummy	C4	?	0.0003	0.0001 **	0.0000	0.0001	0.0005	0.0003
Merger * Asset Growth	C4*C3	?	-0.0016	0.0019	-0.0007	0.0016	-0.0121	0.0030 ***
Year 1999 Dummy	Y99		-0.0007	0.0002 ***	-0.0002	0.0001		
Year 2000 Dummy	Y00		-0.0009	0.0003 ***	-0.0003	0.0002		
Year 2001 Dummy	Y01		-0.0031	0.0006 ***	-0.0024	0.0005 ***		
Year 2002 Dummy	Y02		-0.0024	0.0005 ***	-0.0017	0.0005 ***		
Year 2003 Dummy	Y03		-0.0028	0.0005 ***	-0.0021	0.0004 ***		
Year 2004 Dummy	Y04		-0.0029	0.0006 ***	-0.0022	0.0004 ***		
Year 2005 Dummy	Y05		-0.0028	0.0006 ***	-0.0021	0.0004 ***		
Year 2006 Dummy	Y06		-0.0029	0.0006 ***	-0.0022	0.0004 ***		
Year 2007 Dummy	Y07		-0.0037	0.0006 ***				
Year 2008 Dummy	Y08		-0.0054	0.0007 ***			-0.0018	0.0002 ***
First-order Coefficient of Autocorrelation	AR(1)		0.4041	0.0779 ***	0.6141	0.0845 ***	0.1552	0.0384 ***
Observations			9798		7886		1911	
Adjusted R-squared			0.5961		0.6854		0.4131	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 14: Risk Adjusted Return on Asset (RAROA) Regressions for Larger Community BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROA	Std. Error	RAROA	Std. Error	RAROA	Std. Error
Activity diversification								
	C		9.4681	5.7859	-12.6642	6.5625 *	-11.0618	8.4472
Domestic Geographic Div. (DGD)	H2	?	-3.6771	4.5285	-5.0633	5.5688	14.4625	7.7905 *
Loan Div. (LD)	H3	?	-4.2715	6.4171	0.7726	6.5876	8.4068	8.6052
Security Div. (SD)	H4	?	-0.9679	0.8341	-0.9856	0.9506	6.1264	3.0385 **
Non-interest-income Div. (NIID)	H5	?	1.6173	0.5958 ***	1.9456	0.7661 **	2.5884	1.3963 *
Off-balance-sheet Div. (OBSD)	H6	?	-1.3716	1.1498	-0.7977	1.2858	-3.1212	4.0448
Scale variables								
Deposit Ratio	S2	+	2.4754	1.6012	1.6149	1.9823	3.4567	2.2641
Loan Ratio	S3	+	-0.1613	4.9152	8.5610	5.6226	13.9327	6.3848 **
Security Ratio	S4	+	3.4057	2.0121 *	2.6950	2.2782	21.2158	5.8909 ***
Non-interest-income Ratio	S5	?	0.5481	7.6259	3.2836	6.3189	-106.6094	41.7256 **
Off-balance-sheet Ratio	S6	?	-0.0464	0.1281	0.0481	0.1244	6.9003	3.7731 *
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.2461	4.4674	3.2867	5.2972	-2.6452	7.7749
Loan Div. (LD)	H3*S3	?	9.3277	10.7188	-1.5968	10.5894	-6.7390	12.3465
Security Div. (SD)	H4*S4	?	4.4619	4.0205	2.3172	4.7916	-7.9477	9.5978
Non-interest-income Div. (NIID)	H5*S5	?	23.1319	23.0785	5.2184	18.1782	245.4352	104.3305 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0972	1.6419	-1.5741	1.5034	-1.7293	7.3549
Activity interaction								
DGD * LD	H2*H3	?	8.8135	6.5235	4.6018	7.2359	-20.3855	11.6341 *
DGD * NIID	H2*H5	?	-2.2599	3.4212	-0.0343	3.6732	1.8365	6.9365
SD * OBSD	H4*H6	?	3.0627	2.1029	1.8236	2.4247	0.8776	5.8348
All Activities	H2*H3*H4*H5*H6	?	4.7663	17.2506	-12.6874	17.3530	-59.9694	34.4299 *
Control variables								
International Loan Activity Dummy	ILAD	+	2.9184	3.4627	2.0109	4.0160	5.9942	2.8614 **
Log Asset	C1	?	-0.6456	0.7246	2.1406	0.8047 ***	-1.2042	0.8919
Equity Ratio	C2	?	12.9558	6.8724 *	9.7725	5.8679 *	26.8647	8.4732 ***
Asset Growth	C3	+	-1.5258	0.5709 ***	-2.1338	0.5894 ***	-1.0499	1.5728
Merger Dummy	C4	?	-0.2804	0.1781	-0.2516	0.2331	-1.0196	0.5137 **
Merger * Asset Growth	C4*C3	?	-1.6624	1.1100	-2.8047	1.3878 **	1.4193	2.1322
Year 1999 Dummy	Y99		-0.6617	0.1752 ***	-0.3505	0.1815 *		
Year 2000 Dummy	Y00		-1.1254	0.2597 ***	-0.5466	0.2725 **		
Year 2001 Dummy	Y01		-2.6382	0.4533 ***	-1.5801	0.4621 ***		
Year 2002 Dummy	Y02		-2.7919	0.4946 ***	-1.5008	0.5069 ***		
Year 2003 Dummy	Y03		-3.3281	0.5426 ***	-1.8494	0.5601 ***		
Year 2004 Dummy	Y04		-3.0170	0.5924 ***	-1.3635	0.6031 **		
Year 2005 Dummy	Y05		-3.2657	0.6289 ***	-1.4433	0.6411 **		
Year 2006 Dummy	Y06		-4.2627	0.6520 ***	-2.1352	0.6684 ***		
Year 2007 Dummy	Y07		-5.4576	0.6865 ***				
Year 2008 Dummy	Y08		-6.4190	0.7148 ***			-2.4588	0.2450 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8908	0.0100 ***	0.8887	0.0110 ***	0.7287	0.0331 ***
Observations			9798		7886		1911	
Adjusted R-squared			0.7957		0.7970		0.5905	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



**Appendix 15: Return on Equity (ROE) Regressions for Larger Community BHCs**

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	ROE	Std. Error	ROE	Std. Error	ROE	Std. Error
Activity diversification								
	C		-0.0012	0.0163	-0.0032	0.0106	-0.1854	0.1243
Domestic Geographic Div. (DGD)	H2	?	-0.0887	0.0406 **	-0.0240	0.0163	-0.2591	0.1436 *
Loan Div. (LD)	H3	?	0.0273	0.0258	0.0122	0.0131	0.1091	0.1093
Security Div. (SD)	H4	?	-0.0113	0.0038 ***	-0.0073	0.0032 **	0.0037	0.0312
Non-interest-income Div. (NIID)	H5	?	0.0071	0.0051	0.0005	0.0032	0.0225	0.0265
Off-balance-sheet Div. (OBSD)	H6	?	0.0011	0.0072	0.0011	0.0048	0.0637	0.0599
Scale variables								
Deposit Ratio	S2	+	0.0131	0.0051 ***	0.0070	0.0053	0.0293	0.0191
Loan Ratio	S3	+	0.0554	0.0224 **	0.0379	0.0115 ***	0.2795	0.1421 **
Security Ratio	S4	+	0.0509	0.0083 ***	0.0232	0.0074 ***	0.3205	0.1059 ***
Non-interest-income Ratio	S5	+	0.8611	0.1602 ***	1.0205	0.1539 ***	-0.1799	0.5467
Off-balance-sheet Ratio	S6	?	0.0014	0.0013	-0.0001	0.0007	0.1016	0.0293 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0861	0.0384 **	0.0048	0.0174	0.2704	0.1124 **
Loan Div. (LD)	H3*S3	?	-0.0345	0.0373	-0.0239	0.0187	-0.1253	0.1513
Security Div. (SD)	H4*S4	?	0.0122	0.0151	0.0021	0.0126	0.0458	0.0865
Non-interest-income Div. (NIID)	H5*S5	?	0.4750	0.5713	0.2443	0.4843	6.2355	2.4305 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0030	0.0056	-0.0041	0.0060	-0.1320	0.0576 **
Activity interaction								
DGD * LD	H2*H3	+	-0.0059	0.0275	0.0067	0.0131	-0.0561	0.1213
DGD * NIID	H2*H5	+	0.0372	0.0183 **	0.0191	0.0097 **	0.1416	0.1213
SD * OBSD	H4*H6	+	-0.0076	0.0130	-0.0044	0.0080	-0.0813	0.0816
All Activities	H2*H3*H4*H5*H6	+	-0.0132	0.0729	0.0060	0.0509	-0.2829	0.2745
Control variables								
International Loan Activity Dummy	ILAD		0.0144	0.0039 ***	0.0014	0.0036	0.0402	0.0068 ***
Log Asset	C1	?	-0.0032	0.0018 *	0.0023	0.0010 **	-0.0254	0.0067 ***
Equity Ratio	C2	?	0.0301	0.0357	-0.0586	0.0253 **	0.3379	0.1458 **
Asset Growth	C3	+	0.0543	0.0147 ***	0.0052	0.0051	0.2690	0.0861 ***
Merger Dummy	C4	?	0.0046	0.0014 ***	0.0004	0.0009	0.0141	0.0057 **
Merger * Asset Growth	C4*C3	?	-0.0751	0.0156 ***	-0.0246	0.0071 ***	-0.2767	0.0884 ***
Year 1999 Dummy	Y99		-0.0026	0.0021	-0.0005	0.0013		
Year 2000 Dummy	Y00		-0.0035	0.0023	-0.0014	0.0016		
Year 2001 Dummy	Y01		-0.0145	0.0027 ***	-0.0074	0.0019 ***		
Year 2002 Dummy	Y02		-0.0102	0.0027 ***	-0.0029	0.0019		
Year 2003 Dummy	Y03		-0.0117	0.0028 ***	-0.0046	0.0019 **		
Year 2004 Dummy	Y04		-0.0125	0.0028 ***	-0.0058	0.0020 ***		
Year 2005 Dummy	Y05		-0.0119	0.0030 ***	-0.0059	0.0023 ***		
Year 2006 Dummy	Y06		-0.0113	0.0029 ***	-0.0055	0.0020 ***		
Year 2007 Dummy	Y07		-0.0179	0.0030 ***				
Year 2008 Dummy	Y08		-0.0458	0.0053 ***			-0.0260	0.0033 ***
First-order Coefficient of Autocorrelation	AR(1)		0.1868	0.0588 ***	0.4453	0.0996 ***	0.0801	0.0431 *
Observations			9798		7886		1911	
Adjusted R-squared			0.1392		0.3097		0.1186	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 16: Risk Adjusted Return on Equity (RAROE) Regressions for Larger Community BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROE	Std. Error	RAROE	Std. Error	RAROE	Std. Error
Activity diversification								
	C		7.1137	6.4711	-11.0082	7.2442	-3.0771	7.9607
Domestic Geographic Div. (DGD)	H2	?	-4.5540	5.0215	-2.3533	5.2028	11.0993	6.0245 *
Loan Div. (LD)	H3	?	1.6103	7.1208	9.4223	7.7895	14.6937	8.4597 *
Security Div. (SD)	H4	?	0.2418	1.0164	0.3206	1.1399	4.8504	2.5526 *
Non-interest-income Div. (NIID)	H5	?	1.5922	0.7838 **	1.5667	0.9700	2.4995	1.3439 *
Off-balance-sheet Div. (OBSD)	H6	?	-0.7425	1.6342	0.2551	1.7520	-4.6711	3.4109
Scale variables								
Deposit Ratio	S2	+	2.3823	2.2093	2.4854	2.3583	3.5483	1.9597 *
Loan Ratio	S3	+	1.9251	4.6046	11.4876	5.7141 **	15.8032	6.2056 **
Security Ratio	S4	+	2.4559	2.0404	2.4116	2.5714	20.2767	5.6503 ***
Non-interest-income Ratio	S5	?	12.6739	5.6403 **	15.7211	6.3748 **	-89.1295	59.9938
Off-balance-sheet Ratio	S6	?	0.1158	0.1795	0.2204	0.1970	6.6731	3.1973 **
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	4.0310	5.9759	1.9337	5.8727	-2.1626	6.2540
Loan Div. (LD)	H3*S3	?	0.5178	10.7049	-13.7526	11.4067	-13.8685	12.0358
Security Div. (SD)	H4*S4	?	2.9835	4.1377	-0.3796	5.1924	-7.3130	9.2114
Non-interest-income Div. (NIID)	H5*S5	?	18.2771	22.1723	4.1583	19.0851	217.8506	122.0292 *
Off-balance-sheet Div. (OBSD)	H6*S6	?	-1.6451	2.2574	-3.5027	2.4492	-1.8205	6.3915
Activity interaction								
DGD * LD	H2*H3	?	1.9734	6.9636	-2.5466	7.2420	-13.2046	9.5085
DGD * NIID	H2*H5	?	0.7094	3.7969	4.4189	4.1461	0.8211	6.9422
SD * OBSD	H4*H6	?	2.7448	2.3563	1.8514	2.7195	3.3476	5.1671
All Activities	H2*H3*H4*H5*H6	?	-8.0728	18.8211	-19.7587	20.0648	-51.0833	26.5091 *
Control variables								
International Loan Activity Dummy	ILAD	+	2.2006	3.6817	1.3721	3.4083	7.2753	1.3690 ***
Log Asset	C1	?	-0.1982	0.7313	1.6649	0.8319 **	-2.4544	0.7472 ***
Equity Ratio	C2	?	-3.4128	5.6974	-6.5803	5.2006	12.5429	7.4124 *
Asset Growth	C3	+	-0.5629	0.6364	-0.9426	0.7040	0.0008	1.4007
Merger Dummy	C4	?	-0.2910	0.1868	-0.4121	0.2573	-0.6525	0.4566
Merger * Asset Growth	C4*C3	?	-3.3410	1.5221 **	-3.9298	1.9643 **	-0.8119	1.9681
Year 1999 Dummy	Y99		-0.5910	0.2416 **	-0.2260	0.2393		
Year 2000 Dummy	Y00		-1.1664	0.3166 ***	-0.5091	0.3247		
Year 2001 Dummy	Y01		-3.1374	0.5358 ***	-1.9904	0.5650 ***		
Year 2002 Dummy	Y02		-3.2368	0.5867 ***	-1.8520	0.6236 ***		
Year 2003 Dummy	Y03		-3.7051	0.6353 ***	-2.1234	0.6823 ***		
Year 2004 Dummy	Y04		-3.8729	0.6965 ***	-2.1283	0.7476 ***		
Year 2005 Dummy	Y05		-4.2181	0.7535 ***	-2.3047	0.8076 ***		
Year 2006 Dummy	Y06		-5.2223	0.7924 ***	-3.0282	0.8602 ***		
Year 2007 Dummy	Y07		-6.5835	0.8374 ***				
Year 2008 Dummy	Y08		-7.6523	0.8839 ***			-2.3367	0.2273 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8799	0.0124 ***	0.8768	0.0144 ***	0.7137	0.0238 ***
Observations			9798		7886		1911	
Adjusted R-squared			0.7839		0.7773		0.5922	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 17: Stock Return (SR) Regressions for Larger Community BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			SR	Std. Error	SR	Std. Error	SR	Std. Error
Activity diversification								
	C		0.0687	0.1168	0.0759	0.1143	-1.1057	0.4745 **
Domestic Geographic Div. (DGD)	H2	?	-0.0280	0.1649	-0.0745	0.1446	0.2514	0.5281
Loan Div. (LD)	H3	?	0.0598	0.1380	0.1209	0.1258	0.1833	0.4108
Security Div. (SD)	H4	?	0.0260	0.0327	0.0299	0.0339	0.1403	0.1397
Non-interest-income Div. (NIID)	H5	?	0.0179	0.0273	0.0123	0.0282	0.1713	0.1755
Off-balance-sheet Div. (OBSD)	H6	?	0.0233	0.0352	0.0175	0.0382	-0.1302	0.1761
Scale variables								
Deposit Ratio	S2	+	0.0404	0.0314	0.0488	0.0322	0.1786	0.1258
Loan Ratio	S3	+	-0.0369	0.1486	-0.0008	0.1447	0.5943	0.3823
Security Ratio	S4	+	0.0106	0.0930	-0.0621	0.0934	0.9671	0.3165 ***
Non-interest-income Ratio	S5	+	1.7227	3.7975	2.5384	4.1173	1.2005	19.5999
Off-balance-sheet Ratio	S6	?	-0.0006	0.0060	0.0032	0.0048	-0.2293	0.1347 *
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0369	0.1785	-0.0172	0.1656	0.2705	0.6552
Loan Div. (LD)	H3*S3	?	-0.0248	0.2087	-0.2143	0.1928	-0.0422	0.6121
Security Div. (SD)	H4*S4	?	0.0250	0.1264	-0.0346	0.1342	-0.2382	0.5290
Non-interest-income Div. (NIID)	H5*S5	?	-4.0414	7.0339	-11.3855	7.3835	9.0286	31.7600
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0174	0.0230	0.0103	0.0238	0.3869	0.2458
Activity interaction								
DGD * LD	H2*H3	?	-0.1296	0.1487	0.0280	0.1247	-0.1034	0.5009
DGD * NIID	H2*H5	?	0.1136	0.1118	0.1365	0.1034	-0.5942	0.4524
SD * OBSD	H4*H6	?	-0.0808	0.0633	-0.0538	0.0678	-0.0985	0.2476
All Activities	H2*H3*H4*H5*H6	?	-0.0215	0.6075	-0.1834	0.6925	0.4858	1.6706
Control variables								
International Loan Activity Dummy	ILAD		0.0406	0.0149 ***	0.0445	0.0195 **	0.0056	0.0374
Log Asset	C1	?	-0.0213	0.0092 **	-0.0068	0.0092	0.0018	0.0392
Equity Ratio	C2	?	0.0938	0.1696	-0.1119	0.1607	1.1796	0.5152 **
Asset Growth	C3	+	0.1683	0.0664 **	0.1415	0.0640 **	0.1829	0.2153
Merger Dummy	C4	?	0.0031	0.0111	0.0024	0.0117	-0.0369	0.0402
Merger * Asset Growth	C4*C3	?	-0.1906	0.0824 **	-0.1778	0.0809 **	0.0355	0.2596
Year 1999 Dummy	Y99		-0.0158	0.0210	-0.0790	0.0177 ***		
Year 2000 Dummy	Y00		0.0423	0.0200 **	-0.0207	0.0180		
Year 2001 Dummy	Y01		0.0784	0.0215 ***	0.0287	0.0193		
Year 2002 Dummy	Y02		0.0352	0.0212 *	-0.0092	0.0189		
Year 2003 Dummy	Y03		0.0850	0.0209 ***	0.0376	0.0187 **		
Year 2004 Dummy	Y04		0.0493	0.0208 **	0.0025	0.0185		
Year 2005 Dummy	Y05		0.0167	0.0206	-0.0384	0.0183 **		
Year 2006 Dummy	Y06		0.0461	0.0207 **	-0.0052	0.0186		
Year 2007 Dummy	Y07		-0.0464	0.0211 **				
Year 2008 Dummy	Y08		0.0107	0.0289			0.0777	0.0152 ***
First-order Coefficient of Autocorrelation	AR(1)		-0.2866	0.0336 ***	-0.1564	0.0307 ***	-0.4606	0.0611 ***
Observations			2869		2309		559	
Adjusted R-squared			0.1409		0.0856		0.2254	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 18: Risk Adjusted Stock Return (RASR) Regressions for Larger Community BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RASR	Std. Error	RASR	Std. Error	RASR	Std. Error
Activity diversification								
	C		0.0773	0.6999	-0.4442	0.7170	-3.5384	2.7310
Domestic Geographic Div. (DGD)	H2	?	0.1911	1.0090	-0.4003	1.0702	2.9029	2.6875
Loan Div. (LD)	H3	?	1.4598	0.8190 *	1.7786	0.8217 **	4.1580	2.6142
Security Div. (SD)	H4	?	-0.0313	0.2027	0.0118	0.2121	0.6511	0.8159
Non-interest-income Div. (NIID)	H5	?	0.1135	0.1801	0.1037	0.1853	1.2455	1.0003
Off-balance-sheet Div. (OBSD)	H6	?	0.1873	0.2401	0.1496	0.2542	-0.9065	1.1141
Scale variables								
Deposit Ratio	S2	+	0.3983	0.2042 *	0.3676	0.2115 *	1.4584	0.7756 *
Loan Ratio	S3	+	0.7606	0.7488	1.1950	0.7479	3.1130	2.0534
Security Ratio	S4	+	0.4249	0.5141	0.0807	0.5314	5.0622	1.6960 ***
Non-interest-income Ratio	S5	?	-0.8340	23.1112	11.0279	23.3233	-7.6134	119.2474
Off-balance-sheet Ratio	S6	?	0.0118	0.0356	0.0356	0.0278	-0.6489	0.9001
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.4891	1.0769	-0.7170	1.1470	1.9562	3.6053
Loan Div. (LD)	H3*S3	?	-1.6938	1.2598	-2.8768	1.2770 **	-4.2464	3.8495
Security Div. (SD)	H4*S4	?	0.3105	0.8120	-0.1042	0.8606	-2.7154	3.0937
Non-interest-income Div. (NIID)	H5*S5	?	4.8792	44.2908	-60.6301	43.0804	87.0334	198.6100
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0101	0.1478	-0.0488	0.1413	1.5287	1.6002
Activity interaction								
DGD * LD	H2*H3	?	-0.3308	0.8518	0.8127	0.8926	-0.8958	2.7877
DGD * NIID	H2*H5	?	0.8435	0.6384	1.2065	0.7110 *	-5.9382	2.7881 **
SD * OBSD	H4*H6	?	-0.3892	0.4348	-0.2567	0.4544	-0.1654	1.6277
All Activities	H2*H3*H4*H5*H6	?	-2.4558	3.1989	-3.0237	3.4999	5.7655	11.3690
Control variables								
International Loan Activity Dummy	ILAD	+	0.2211	0.1149 *	0.1867	0.1278	0.1130	0.3072
Log Asset	C1	?	-0.1827	0.0653 ***	-0.0311	0.0686	-0.4964	0.2306 **
Equity Ratio	C2	?	0.9889	0.9730	-0.0850	1.0183	6.9270	2.7759 **
Asset Growth	C3	+	0.7717	0.3675 **	0.6016	0.3685	0.0340	1.3452
Merger Dummy	C4	?	0.0259	0.0891	-0.0113	0.0937	-0.0408	0.2951
Merger * Asset Growth	C4*C3	?	-0.8890	0.5544	-0.8394	0.5424	1.4355	1.9674
Year 1999 Dummy	Y99		-0.3080	0.1198 **	-0.6089	0.1152 ***		
Year 2000 Dummy	Y00		0.1024	0.1196	-0.2055	0.1187 *		
Year 2001 Dummy	Y01		0.3301	0.1260 ***	0.1053	0.1233		
Year 2002 Dummy	Y02		0.0453	0.1241	-0.1591	0.1213		
Year 2003 Dummy	Y03		0.4769	0.1249 ***	0.2634	0.1222 **		
Year 2004 Dummy	Y04		0.3085	0.1262 **	0.0886	0.1237		
Year 2005 Dummy	Y05		-0.0567	0.1251	-0.3344	0.1227 ***		
Year 2006 Dummy	Y06		0.2809	0.1273 **	0.0314	0.1287		
Year 2007 Dummy	Y07		-0.7449	0.1295 ***				
Year 2008 Dummy	Y08		-0.1786	0.1636			0.7047	0.0949 ***
First-order Coefficient of Autocorrelation	AR(1)		-0.2549	0.0209 ***	-0.1753	0.0214 ***	-0.4218	0.0425 ***
Observations			2869		2309		559	
Adjusted R-squared			0.1782		0.1042		0.2394	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 19: Net Charge Off (NCO) Regressions for Larger Community BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			NCO	Std. Error	NCO	Std. Error	NCO	Std. Error
Activity diversification								
	C		-0.0046	0.0017 ***	-0.0045	0.0019 **	-0.0009	0.0041
Domestic Geographic Div. (DGD)	H2	?	-0.0018	0.0027	-0.0020	0.0028	-0.0076	0.0080
Loan Div. (LD)	H3	?	-0.0036	0.0030	-0.0011	0.0025	-0.0081	0.0046 *
Security Div. (SD)	H4	?	0.0003	0.0006	0.0002	0.0006	-0.0006	0.0012
Non-interest-income Div. (NIID)	H5	?	-0.0013	0.0005 **	-0.0011	0.0006 *	-0.0005	0.0007
Off-balance-sheet Div. (OBSD)	H6	?	0.0009	0.0004 **	0.0003	0.0003	0.0019	0.0016
Scale variables								
Deposit Ratio	S2	-	0.0000	0.0010	0.0010	0.0012	-0.0021	0.0007 ***
Loan Ratio	S3	?	0.0007	0.0024	0.0017	0.0020	-0.0026	0.0053
Security Ratio	S4	?	0.0000	0.0007	0.0002	0.0007	-0.0066	0.0037 *
Non-interest-income Ratio	S5	?	0.0719	0.0413 *	0.0576	0.0378	0.2340	0.0370 ***
Off-balance-sheet Ratio	S6	?	-0.0001	0.0000	-0.0001	0.0000 ***	-0.0042	0.0011 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0026	0.0036	-0.0016	0.0039	-0.0015	0.0094
Loan Div. (LD)	H3*S3	?	0.0054	0.0044	0.0025	0.0038	0.0110	0.0063 *
Security Div. (SD)	H4*S4	?	-0.0016	0.0024	-0.0001	0.0019	0.0031	0.0036
Non-interest-income Div. (NIID)	H5*S5	?	-0.0519	0.1265	-0.0584	0.1384	-0.4583	0.0987 ***
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0005	0.0004	0.0001	0.0004	0.0040	0.0026
Activity interaction								
DGD * LD	H2*H3	?	0.0038	0.0022 *	0.0035	0.0020 *	0.0006	0.0048
DGD * NIID	H2*H5	?	0.0026	0.0013 **	0.0022	0.0013 *	0.0122	0.0047 **
SD * OBSD	H4*H6	?	-0.0017	0.0008 **	-0.0012	0.0007	-0.0032	0.0025
All Activities	H2*H3*H4*H5*H6	?	0.0006	0.0055	0.0030	0.0053	-0.0010	0.0104
Control variables								
International Loan Activity Dummy	ILAD	+	0.0000	0.0005	0.0006	0.0006	-0.0002	0.0003
Log Asset	C1	?	0.0006	0.0002 ***	0.0004	0.0001 ***	0.0012	0.0002 ***
Equity Ratio	C2	?	0.0071	0.0053	0.0103	0.0063	0.0000	0.0034
Asset Growth	C3	+	0.0007	0.0005	0.0011	0.0005 **	-0.0027	0.0011 **
Merger Dummy	C4	?	0.0000	0.0001	0.0000	0.0000	-0.0002	0.0001
Merger * Asset Growth	C4*C3	?	-0.0004	0.0005	-0.0007	0.0005	0.0027	0.0013 **
Year 1999 Dummy	Y99		0.0002	0.0001 **	-0.0001	0.0001		
Year 2000 Dummy	Y00		0.0003	0.0002 **	-0.0001	0.0001		
Year 2001 Dummy	Y01		0.0008	0.0003 **	0.0002	0.0003		
Year 2002 Dummy	Y02		0.0008	0.0004 **	0.0002	0.0003		
Year 2003 Dummy	Y03		0.0008	0.0003 **	0.0001	0.0002		
Year 2004 Dummy	Y04		0.0006	0.0003 *	0.0000	0.0002		
Year 2005 Dummy	Y05		0.0005	0.0003	-0.0001	0.0002		
Year 2006 Dummy	Y06		0.0006	0.0003 *	-0.0002	0.0002		
Year 2007 Dummy	Y07		0.0008	0.0004 **				
Year 2008 Dummy	Y08		0.0014	0.0004 ***			0.0008	0.0001 ***
First-order Coefficient of Autocorrelation	AR(1)		0.6541	0.1650 ***	0.6996	0.2184 ***	0.3540	0.0688 ***
Observations			9798		7886		1911	
Adjusted R-squared			0.5786		0.6055		0.5333	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

## Appendix 20: Maturity Gap (MG) Regressions for Larger Community BHCs

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	MG	Std. Error	MG	Std. Error	MG	Std. Error
Activity diversification								
	C		0.1276	0.1460	0.0879	0.1466	-0.2480	0.1929
Domestic Geographic Div. (DGD)	H2	?	-0.2527	0.1080 **	-0.2939	0.1247 **	-0.3268	0.1800 *
Loan Div. (LD)	H3	?	0.0667	0.1803	0.0524	0.1941	0.5034	0.2549 **
Security Div. (SD)	H4	?	0.0101	0.0207	0.0112	0.0229	-0.1243	0.0805
Non-interest-income Div. (NIID)	H5	?	-0.0119	0.0148	-0.0083	0.0169	-0.0625	0.0321 *
Off-balance-sheet Div. (OBSD)	H6	?	0.0565	0.0355	0.0597	0.0394	0.0236	0.0955
Scale variables								
Deposit Ratio	S2	-	-0.0674	0.0452	-0.0665	0.0468	-0.0007	0.0649
Loan Ratio	S3	?	0.0964	0.1311	0.1103	0.1407	0.4907	0.1722 ***
Security Ratio	S4	?	-0.0531	0.0491	-0.0225	0.0530	-0.2582	0.1753
Non-interest-income Ratio	S5	?	0.5669	0.1576 ***	0.4191	0.1681 **	4.0037	1.1016 ***
Off-balance-sheet Ratio	S6	?	-0.0015	0.0042	-0.0028	0.0044	0.3142	0.0728 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0866	0.1216	0.1758	0.1650	0.0825	0.1799
Loan Div. (LD)	H3*S3	?	-0.2048	0.2541	-0.2598	0.2739	-0.7812	0.3512 **
Security Div. (SD)	H4*S4	?	-0.0098	0.0912	-0.1214	0.1024	0.4964	0.2735 *
Non-interest-income Div. (NIID)	H5*S5	?	-1.7185	0.4379 ***	-1.5773	0.3898 ***	-6.9101	2.7958 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0719	0.0410 *	0.0952	0.0425 **	-0.1383	0.1483
Activity interaction								
DGD * LD	H2*H3	?	0.2147	0.1351	0.1359	0.1633	0.2155	0.2217
DGD * NIID	H2*H5	?	0.1655	0.0677 **	0.2570	0.0860 ***	0.1979	0.1632
SD * OBSD	H4*H6	?	-0.1072	0.0534 **	-0.1210	0.0632 *	-0.0943	0.1417
All Activities	H2*H3*H4*H5*H6	?	-1.0025	0.4028 **	-1.2204	0.4719 ***	-0.1155	1.0662
Control variables								
International Loan Activity Dummy	ILAD	+	0.0409	0.0944	0.0854	0.0752	-0.0133	0.0297
Log Asset	C1	?	0.0071	0.0177	0.0146	0.0170	0.0181	0.0194
Equity Ratio	C2	?	0.1079	0.1386	0.2124	0.1547	-0.0253	0.1755
Asset Growth	C3	+	0.0434	0.0157 ***	0.0378	0.0165 **	0.1164	0.0404 ***
Merger Dummy	C4	?	0.0018	0.0038	0.0040	0.0048	0.0151	0.0079 *
Merger * Asset Growth	C4*C3	?	-0.0682	0.0247 ***	-0.0703	0.0307 **	-0.1492	0.0468 ***
Year 1999 Dummy	Y99		-0.0062	0.0046	-0.0071	0.0047		
Year 2000 Dummy	Y00		-0.0084	0.0068	-0.0099	0.0068		
Year 2001 Dummy	Y01		0.0038	0.0109	0.0050	0.0115		
Year 2002 Dummy	Y02		0.0086	0.0115	0.0088	0.0120		
Year 2003 Dummy	Y03		0.0173	0.0122	0.0159	0.0125		
Year 2004 Dummy	Y04		0.0172	0.0126	0.0148	0.0128		
Year 2005 Dummy	Y05		0.0222	0.0130 *	0.0186	0.0130		
Year 2006 Dummy	Y06		0.0084	0.0134	0.0051	0.0133		
Year 2007 Dummy	Y07		-0.0001	0.0138				
Year 2008 Dummy	Y08		-0.0097	0.0141			-0.0057	0.0052
First-order Coefficient of Autocorrelation	AR(1)		0.8605	0.0077 ***	0.8538	0.0086 ***	0.7705	0.0233 ***
Observations			9798		7886		1911	
Adjusted R-squared			0.7579		0.7477		0.6756	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 21: Derivatives Loss (DL) Regressions for Larger Community BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			DL	Std. Error	DL	Std. Error	DL	Std. Error
Activity diversification								
	C		0.0000	0.0001	0.0000	0.0001	-0.0001	0.0001
Domestic Geographic Div. (DGD)	H2	?	0.0000	0.0001	0.0000	0.0001	0.0003	0.0001 ***
Loan Div. (LD)	H3	?	0.0000	0.0002	0.0000	0.0003	0.0000	0.0001
Security Div. (SD)	H4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Non-interest-income Div. (NIID)	H5	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-balance-sheet Div. (OBSD)	H6	?	-0.0001	0.0000 **	-0.0001	0.0000 **	0.0000	0.0000
Scale variables								
Deposit Ratio	S2	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 **
Loan Ratio	S3	?	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
Security Ratio	S4	?	0.0000	0.0000	-0.0001	0.0000	0.0001	0.0001
Non-interest-income Ratio	S5	?	0.0003	0.0001 *	0.0003	0.0002	0.0002	0.0003
Off-balance-sheet Ratio	S6	?	-0.0001	0.0000 **	-0.0001	0.0000 *	-0.0001	0.0000 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0000	0.0001	0.0001	0.0001	-0.0006	0.0001 ***
Loan Div. (LD)	H3*S3	?	0.0000	0.0003	0.0000	0.0004	0.0000	0.0001
Security Div. (SD)	H4*S4	?	0.0001	0.0001 *	0.0001	0.0001 *	-0.0001	0.0001
Non-interest-income Div. (NIID)	H5*S5	?	-0.0020	0.0011 *	-0.0022	0.0013	-0.0012	0.0014
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0004	0.0002 **	0.0004	0.0002 **	0.0003	0.0000 ***
Activity interaction								
DGD * LD	H2*H3	?	0.0000	0.0001	0.0000	0.0001	0.0003	0.0001 ***
DGD * NIID	H2*H5	?	0.0000	0.0000	-0.0001	0.0000 **	0.0001	0.0001 *
SD * OBSD	H4*H6	?	-0.0001	0.0000	0.0000	0.0001	-0.0001	0.0001
All Activities	H2*H3*H4*H5*H6	?	0.0000	0.0002	0.0000	0.0002	-0.0007	0.0003 **
Control variables								
International Loan Activity Dummy	ILAD	+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log Asset	C1	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Equity Ratio	C2	?	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
Asset Growth	C3	+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger Dummy	C4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger * Asset Growth	C4*C3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Year 1999 Dummy	Y99		0.0000	0.0000	0.0000	0.0000		
Year 2000 Dummy	Y00		0.0000	0.0000	0.0000	0.0000		
Year 2001 Dummy	Y01		0.0000	0.0000 *	0.0000	0.0000		
Year 2002 Dummy	Y02		0.0000	0.0000	0.0000	0.0000		
Year 2003 Dummy	Y03		0.0000	0.0000	0.0000	0.0000		
Year 2004 Dummy	Y04		0.0000	0.0000 *	0.0000	0.0000 *		
Year 2005 Dummy	Y05		0.0000	0.0000 *	0.0000	0.0000 **		
Year 2006 Dummy	Y06		0.0000	0.0000	0.0000	0.0000		
Year 2007 Dummy	Y07		0.0000	0.0000				
Year 2008 Dummy	Y08		0.0000	0.0000 **			0.0000	0.0000
First-order Coefficient of Autocorrelation	AR(1)		-0.3519	0.1800 *	-0.3602	0.1821 **	0.0524	0.0231 **
Observations			9798		7886		1911	
Adjusted R-squared			0.1360		0.1404		0.1125	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

## Appendix 22: Market Beta (MB) Regressions for Larger Community BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MB	Std. Error	MB	Std. Error	MB	Std. Error
Activity diversification								
	C		-1.9138	0.5621 ***	-0.3602	0.5536	6.8083	1.1202 ***
Domestic Geographic Div. (DGD)	H2	?	0.0227	0.4288	-0.5609	0.5971	-0.7201	0.7711
Loan Div. (LD)	H3	?	-0.7521	0.5574	-0.1076	0.6276	-2.9451	1.2480 **
Security Div. (SD)	H4	?	-0.0647	0.0831	0.0328	0.1012	-0.1162	0.3714
Non-interest-income Div. (NIID)	H5	?	-0.1240	0.0642 *	-0.1278	0.0826	-0.3042	0.2348
Off-balance-sheet Div. (OBSD)	H6	?	-0.0288	0.0826	-0.0117	0.1040	0.0506	0.4163
Scale variables								
Deposit Ratio	S2	-	0.1306	0.0908	0.0494	0.1484	-0.5238	0.3191
Loan Ratio	S3	?	-0.1189	0.3547	0.3877	0.4049	-2.6775	0.8534 ***
Security Ratio	S4	?	-0.0519	0.2093	0.1471	0.2260	-0.8501	0.6903
Non-interest-income Ratio	S5	?	-2.1482	4.9309	3.8372	6.8315	-58.5512	31.7622 *
Off-balance-sheet Ratio	S6	?	0.0088	0.0049 *	0.0178	0.0081 **	-0.1051	0.3763
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0043	0.4313	0.1337	0.6927	0.9926	0.9862
Loan Div. (LD)	H3*S3	?	0.8381	0.8942	-0.6725	1.0047	4.8295	1.8560 ***
Security Div. (SD)	H4*S4	?	0.0904	0.3204	-0.1035	0.4220	1.4923	1.5709
Non-interest-income Div. (NIID)	H5*S5	?	2.9165	7.8379	-3.0282	10.7030	89.4688	50.1179 *
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.1091	0.0555 **	-0.2247	0.1014 **	-0.0478	0.6535
Activity interaction								
DGD * LD	H2*H3	?	-0.2761	0.5388	0.7224	0.7954	-2.0104	1.1410 *
DGD * NIID	H2*H5	?	0.0027	0.1698	0.0003	0.2880	1.3731	0.7205 *
SD * OBSD	H4*H6	?	0.2224	0.1465	0.2464	0.2103	0.0559	0.6602
All Activities	H2*H3*H4*H5*H6	?	-0.1394	0.9470	0.0811	1.2852	-1.2056	2.8912
Control variables								
International Loan Activity Dummy	ILAD	+	-0.2260	0.0959 **	-0.1285	0.3036	-0.3235	0.2520
Log Asset	C1	?	0.3928	0.0719 ***	0.0860	0.0760	-0.4138	0.1163 ***
Equity Ratio	C2	?	-0.8184	0.5798	0.0309	0.7327	-2.4080	1.1040 **
Asset Growth	C3	+	-0.0372	0.0399	0.0422	0.0383	-0.5005	0.1895 ***
Merger Dummy	C4	?	-0.0143	0.0069 **	-0.0171	0.0091 *	-0.0550	0.0356
Merger * Asset Growth	C4*C3	?	-0.0009	0.0507	-0.0589	0.0564	0.6895	0.2491 ***
Year 1999 Dummy	Y99		0.0320	0.0081 ***	0.0735	0.0119 ***		
Year 2000 Dummy	Y00		0.0875	0.0136 ***	0.1663	0.0199 ***		
Year 2001 Dummy	Y01		0.1678	0.0262 ***	0.2605	0.0332 ***		
Year 2002 Dummy	Y02		0.2252	0.0294 ***	0.3486	0.0378 ***		
Year 2003 Dummy	Y03		0.2740	0.0335 ***	0.4319	0.0431 ***		
Year 2004 Dummy	Y04		0.3324	0.0368 ***	0.5219	0.0473 ***		
Year 2005 Dummy	Y05		0.3945	0.0403 ***	0.6210	0.0517 ***		
Year 2006 Dummy	Y06		0.6086	0.0426 ***	0.8754	0.0553 ***		
Year 2007 Dummy	Y07		0.6730	0.0459 ***				
Year 2008 Dummy	Y08		0.7358	0.0483 ***			0.0012	0.0192
First-order Coefficient of Autocorrelation	AR(1)		0.9523	0.0079 ***	0.9246	0.0118 ***	0.7582	0.0381 ***
Observations			2869		2309		559	
Adjusted R-squared			0.9639		0.9318		0.7000	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



# Appendix 23: Interest Rate Beta (IRB) Regressions for Larger Community BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			IRB	Std. Error	IRB	Std. Error	IRB	Std. Error
Activity diversification								
	C		-0.0537	0.2245	0.3095	0.2454	0.3126	0.6697
Domestic Geographic Div. (DGD)	H2	?	-0.1665	0.2691	-0.1268	0.2463	0.2770	0.6350
Loan Div. (LD)	H3	?	0.4028	0.2925	0.5345	0.5574	0.3282	0.5865
Security Div. (SD)	H4	?	-0.0244	0.0466	-0.0635	0.0455	-0.2691	0.1670
Non-interest-income Div. (NIID)	H5	?	0.0215	0.0364	-0.0334	0.0372	-0.0379	0.1495
Off-balance-sheet Div. (OBSD)	H6	?	0.0681	0.0498	0.0712	0.0643	0.1835	0.2041
Scale variables								
Deposit Ratio	S2	-	0.0385	0.0608	0.0102	0.0651	-0.2507	0.1527
Loan Ratio	S3	?	0.2948	0.2380	0.3571	0.3940	0.2757	0.5650
Security Ratio	S4	?	-0.2863	0.1360 **	-0.3253	0.1383 **	-1.5951	0.4951 ***
Non-interest-income Ratio	S5	?	1.6307	2.9095	-4.1433	2.8132	14.5598	16.7169
Off-balance-sheet Ratio	S6	?	-0.0030	0.0029	0.0010	0.0034	0.0750	0.1491
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0228	0.2791	-0.1450	0.2543	-0.6385	0.7744
Loan Div. (LD)	H3*S3	?	-0.7688	0.4204 *	-0.7866	0.8001	-0.2771	0.8669
Security Div. (SD)	H4*S4	?	0.3981	0.1999 **	0.4707	0.2257 **	2.4473	0.6674 ***
Non-interest-income Div. (NIID)	H5*S5	?	-3.2817	4.5018	5.1625	4.4303	-31.4239	26.8759
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0270	0.0274	-0.0232	0.0289	0.1497	0.2824
Activity interaction								
DGD * LD	H2*H3	?	0.2959	0.2784	0.3518	0.2576	-1.1269	0.6912
DGD * NIID	H2*H5	?	0.0407	0.1096	0.1645	0.1561	0.7765	0.5201
SD * OBSD	H4*H6	?	-0.0964	0.0945	-0.0496	0.0982	-0.4717	0.2926
All Activities	H2*H3*H4*H5*H6	?	-0.8023	0.4700 *	-0.5207	0.5175	1.5944	1.7681
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0431	0.0320	-0.0063	0.0317	0.0377	0.0458
Log Asset	C1	?	0.0073	0.0217	-0.0561	0.0291 *	-0.0043	0.0456
Equity Ratio	C2	?	-0.7845	0.3064 **	-0.5671	0.3551	-1.5911	0.6022 ***
Asset Growth	C3	+	0.0194	0.0268	-0.0012	0.0243	0.1583	0.1948
Merger Dummy	C4	?	-0.0039	0.0075	-0.0041	0.0075	0.0423	0.0353
Merger * Asset Growth	C4*C3	?	-0.0202	0.0410	0.0140	0.0342	-0.2693	0.2398
Year 1999 Dummy	Y99		0.0102	0.0086	0.0078	0.0065		
Year 2000 Dummy	Y00		-0.0423	0.0136 ***	-0.0415	0.0109 ***		
Year 2001 Dummy	Y01		-0.0885	0.0179 **	-0.0730	0.0150 ***		
Year 2002 Dummy	Y02		-0.1413	0.0192 ***	-0.1297	0.0166 ***		
Year 2003 Dummy	Y03		-0.0436	0.0207 **	-0.0414	0.0180 **		
Year 2004 Dummy	Y04		-0.0591	0.0218 ***	-0.0585	0.0187 ***		
Year 2005 Dummy	Y05		-0.1032	0.0236 ***	-0.0895	0.0197 ***		
Year 2006 Dummy	Y06		-0.0892	0.0234 ***	-0.0641	0.0195 ***		
Year 2007 Dummy	Y07		-0.1020	0.0234 ***				
Year 2008 Dummy	Y08		-0.2968	0.0212 ***			-0.1861	0.0138 ***
First-order Coefficient of Autocorrelation	AR(1)		0.7325	0.0223 ***	0.8175	0.0210 ***	0.3761	0.0479 ***
Observations			2869		2309		559	
Adjusted R-squared			0.6846		0.7091		0.4577	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 24: Distance to Default (Z-Score) Regressions for Larger Community BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			Z	Std. Error	Z	Std. Error	Z	Std. Error
Activity diversification								
	C		103.34	169.88	-418.39	199.60 **	-93.85	244.66
Domestic Geographic Div. (DGD)	H2	?	-48.19	131.08	-96.71	178.36	573.78	217.86 ***
Loan Div. (LD)	H3	?	-48.04	185.90	112.80	192.25	-13.15	289.97
Security Div. (SD)	H4	?	-34.05	23.56	-42.64	27.11	197.38	85.80 **
Non-interest-income Div. (NIID)	H5	?	45.73	15.90 ***	39.16	22.01 *	81.29	39.10 **
Off-balance-sheet Div. (OBSD)	H6	?	-41.29	26.90	-35.21	37.51	-95.10	120.88
Scale variables								
Deposit Ratio	S2	+	94.40	47.27 **	67.48	68.56	30.35	68.04
Loan Ratio	S3	?	79.33	167.82	297.67	187.55	214.49	180.83
Security Ratio	S4	?	51.34	53.47	13.41	61.78	439.87	174.02 **
Non-interest-income Ratio	S5	?	-662.52	427.56	-661.40	395.73 *	-6155.35	1072.13 ***
Off-balance-sheet Ratio	S6	?	-2.92	2.68	-0.41	2.04	14.02	112.69
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-90.05	119.59	14.76	171.52	-173.70	213.84
Loan Div. (LD)	H3*S3	?	66.63	336.55	-253.29	333.24	148.21	398.03
Security Div. (SD)	H4*S4	?	186.04	116.21	162.43	138.87	-125.36	292.81
Non-interest-income Div. (NIID)	H5*S5	?	46.66	615.68	-19.54	576.20	5350.48	2808.75 *
Off-balance-sheet Div. (OBSD)	H6*S6	?	38.50	34.64	-10.23	22.82	238.31	220.88
Activity interaction								
DGD * LD	H2*H3	?	283.22	191.56	175.41	218.77	-910.83	355.63 **
DGD * NIID	H2*H5	?	0.00	88.24	62.42	103.09	132.68	182.59
SD * OBSD	H4*H6	?	65.24	49.60	48.61	70.54	-82.30	168.91
All Activities	H2*H3*H4*H5*H6	?	-365.78	453.47	-745.31	486.32	-1249.42	958.44
Control variables								
International Loan Activity Dummy	ILAD	-	84.06	68.88	1.99	74.60	116.58	24.83 ***
Log Asset	C1	?	-6.45	20.07	60.44	24.23 **	-32.58	27.37
Equity Ratio	C2	?	943.28	261.83 ***	815.83	246.80 ***	1387.32	277.63 ***
Asset Growth	C3	-	-9.03	17.97	-35.55	18.73 *	4.53	47.23
Merger Dummy	C4	?	-4.26	4.73	-1.91	6.52	-26.83	14.06 *
Merger * Asset Growth	C4*C3	?	-36.19	30.26	-69.18	36.98 *	61.94	68.32
Year 1999 Dummy	Y99		-12.41	4.20 ***	-6.06	4.66		
Year 2000 Dummy	Y00		-25.32	6.59 ***	-12.71	7.52 *		
Year 2001 Dummy	Y01		-54.87	11.85 ***	-24.46	12.82 *		
Year 2002 Dummy	Y02		-72.07	13.35 ***	-35.98	14.44 **		
Year 2003 Dummy	Y03		-83.45	14.91 ***	-42.08	16.16 ***		
Year 2004 Dummy	Y04		-71.84	16.68 ***	-26.04	17.71		
Year 2005 Dummy	Y05		-77.04	18.01 ***	-27.21	19.17		
Year 2006 Dummy	Y06		-95.40	18.76 ***	-38.45	20.07 *		
Year 2007 Dummy	Y07		-112.17	20.10 ***				
Year 2008 Dummy	Y08		-136.32	21.28 ***			-58.43	6.75 ***
First-order Coefficient of Autocorrelation	AR(1)		0.90	0.01 ***	0.90	0.01 ***	0.79	0.03 ***
Observations			9798		7886		1911	
Adjusted R-squared			0.8204		0.8123		0.6703	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 25: Return on Asset (ROA) Regressions for Regional BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROA	Std. Error	ROA	Std. Error	ROA	Std. Error
Activity diversification								
	C		-0.0014	0.0099	0.0157	0.0063 **	-0.0586	0.1618
Domestic Geographic Div. (DGD)	H2	?	0.0033	0.0059	-0.0002	0.0033	-0.0193	0.0571
Loan Div. (LD)	H3	?	0.0074	0.0099	-0.0047	0.0040	0.0876	0.1124
Security Div. (SD)	H4	?	0.0018	0.0051	-0.0030	0.0029	-0.0445	0.0487
Non-interest-income Div. (NIID)	H5	?	0.0008	0.0017	0.0017	0.0010	-0.0299	0.0181
Off-balance-sheet Div. (OBSD)	H6	?	-0.0009	0.0028	-0.0019	0.0015	-0.0366	0.0273
Scale variables								
Deposit Ratio	S2	+	-0.0006	0.0038	0.0024	0.0014 *	-0.0269	0.0185
Loan Ratio	S3	+	0.0113	0.0096	-0.0021	0.0031	0.0865	0.0921
Security Ratio	S4	+	0.0138	0.0069 **	0.0035	0.0027	-0.0045	0.0693
Non-interest-income Ratio	S5	+	-0.0222	0.0616	0.0221	0.0396	-1.7594	2.8638
Off-balance-sheet Ratio	S6	?	-0.0015	0.0010	-0.0011	0.0005 **	-0.0091	0.0139
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0091	0.0084	-0.0066	0.0044	0.0139	0.0502
Loan Div. (LD)	H3*S3	?	-0.0100	0.0125	0.0086	0.0056	-0.1343	0.1536
Security Div. (SD)	H4*S4	?	-0.0068	0.0146	0.0064	0.0066	-0.0091	0.1502
Non-interest-income Div. (NIID)	H5*S5	?	0.2652	0.1941	0.1294	0.0779 *	2.9734	4.4561
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0035	0.0017 **	0.0020	0.0008 **	0.0176	0.0218
Activity interaction								
DGD * LD	H2*H3	?	-0.0006	0.0080	0.0070	0.0032 **	-0.0428	0.0575
DGD * NIID	H2*H5	?	0.0024	0.0050	0.0027	0.0031	0.0998	0.0766
SD * OBSD	H4*H6	?	-0.0009	0.0062	0.0017	0.0039	0.0854	0.0660
All Activities	H2*H3*H4*H5*H6	?	0.0132	0.0162	0.0020	0.0089	-0.3057	0.2330
Control variables								
International Loan Activity Dummy	ILAD		0.0017	0.0007 **	0.0005	0.0003	0.0090	0.0042 **
Log Asset	C1	?	-0.0013	0.0017	-0.0021	0.0008 **	0.0058	0.0227
Equity Ratio	C2	?	0.0474	0.0310	0.0166	0.0074 **	0.1329	0.1460
Asset Growth	C3	+	-0.0008	0.0012	-0.0017	0.0006 ***	0.0302	0.0365
Merger Dummy	C4	?	0.0004	0.0005	-0.0001	0.0002	0.0038	0.0025
Merger * Asset Growth	C4*C3	?	0.0001	0.0029	-0.0015	0.0022	-0.0442	0.0400
Year 1999 Dummy	Y99		0.0003	0.0010	0.0006	0.0003 *		
Year 2000 Dummy	Y00		0.0000	0.0011	0.0003	0.0004		
Year 2001 Dummy	Y01		-0.0016	0.0012	-0.0007	0.0004 *		
Year 2002 Dummy	Y02		-0.0009	0.0012	-0.0001	0.0004		
Year 2003 Dummy	Y03		-0.0009	0.0012	0.0000	0.0004		
Year 2004 Dummy	Y04		-0.0010	0.0013	0.0000	0.0004		
Year 2005 Dummy	Y05		-0.0009	0.0014	0.0001	0.0004		
Year 2006 Dummy	Y06		-0.0014	0.0014	-0.0001	0.0004		
Year 2007 Dummy	Y07		-0.0030	0.0016 *				
Year 2008 Dummy	Y08		-0.0069	0.0021 ***			-0.0046	0.0016 ***
First-order Coefficient of Autocorrelation	AR(1)		0.0878	0.1368	0.2214	0.0780 ***	-0.2104	0.1648
Observations			409		329		79	
Adjusted R-squared			0.3342		0.4593		0.1391	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

## Appendix 26: Risk Adjusted Return on Asset (RAROA) Regressions for Regional BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROA	Std. Error	RAROA	Std. Error	RAROA	Std. Error
Activity diversification								
	C		-16.1969	31.0655	16.8499	32.1958	-120.3745	98.5790
Domestic Geographic Div. (DGD)	H2	?	24.3230	12.8691 *	40.1485	15.8281 **	5.0937	23.4451
Loan Div. (LD)	H3	?	34.9827	19.1800 *	56.1155	24.2368 **	-33.4130	47.7617
Security Div. (SD)	H4	?	-22.5666	9.6732 **	-23.9513	10.8739 **	-25.5999	22.5903
Non-interest-income Div. (NIID)	H5	?	5.2295	3.8494	2.8273	4.7800	-7.4118	7.6514
Off-balance-sheet Div. (OBSD)	H6	?	-2.3209	6.4956	-0.6017	6.7977	-11.2256	15.0390
Scale variables								
Deposit Ratio	S2	+	5.4030	7.0532	7.0776	8.1967	7.2147	7.4551
Loan Ratio	S3	+	26.5418	14.1829 *	22.1842	15.3579	28.6820	41.1003
Security Ratio	S4	+	-14.2690	14.0273	-25.8606	16.6105	24.6108	32.8384
Non-interest-income Ratio	S5	?	109.5573	104.4995	51.2938	127.7798	201.2462	867.0170
Off-balance-sheet Ratio	S6	?	-0.4755	3.1536	0.0644	3.8059	21.2281	6.0880 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-18.9728	12.9311	-24.3355	15.9546	-17.0996	16.1294
Loan Div. (LD)	H3*S3	?	-43.8865	25.4157 *	-63.0398	31.6916 **	15.2538	71.4722
Security Div. (SD)	H4*S4	?	135.3170	50.6792 ***	154.0378	56.2095 ***	60.5886	75.6386
Non-interest-income Div. (NIID)	H5*S5	?	-444.8535	367.3678	-440.7609	492.0932	852.5591	1308.1140
Off-balance-sheet Div. (OBSD)	H6*S6	?	3.2524	5.0570	1.1917	6.0362	-24.8881	9.2798 ***
Activity interaction								
DGD * LD	H2*H3	?	-6.2931	17.6411	-21.2801	22.9967	-53.6617	37.5062
DGD * NIID	H2*H5	?	-12.0818	11.9202	-17.7397	14.0349	39.2008	27.1754
SD * OBSD	H4*H6	?	0.8346	10.9411	0.8933	11.8539	35.8968	29.2713
All Activities	H2*H3*H4*H5*H6	?	8.0610	45.2055	-0.2986	51.8146	2.5476	80.3661
Control variables								
International Loan Activity Dummy	ILAD	+	-0.8424	3.8492	2.0920	5.7890	0.5024	1.8886
Log Asset	C1	?	0.2949	3.5030	-5.5483	3.8060	14.5903	12.3123
Equity Ratio	C2	?	29.0657	24.8926	100.8614	48.5768 **	-6.5593	33.5533
Asset Growth	C3	+	-1.5352	1.5297	-1.0619	1.6494	-2.7494	11.3406
Merger Dummy	C4	?	-0.0380	0.6409	0.5495	0.6605	-0.9627	2.1850
Merger * Asset Growth	C4*C3	?	2.7712	5.1641	-7.1563	3.6064 **	10.5756	11.6670
Year 1999 Dummy	Y99		-1.0138	0.8191	0.0643	0.7466		
Year 2000 Dummy	Y00		-3.2837	1.4489 **	-1.0209	1.3640		
Year 2001 Dummy	Y01		-5.9911	1.9723 ***	-1.6386	2.2029		
Year 2002 Dummy	Y02		-6.7598	1.9619 ***	-1.8750	2.2006		
Year 2003 Dummy	Y03		-7.5156	2.1087 ***	-1.6348	2.4545		
Year 2004 Dummy	Y04		-7.3915	2.3373 ***	-0.5932	2.5894		
Year 2005 Dummy	Y05		-7.5394	2.3279 ***	0.3220	2.5982		
Year 2006 Dummy	Y06		-9.0260	2.4418 ***	-0.3774	2.6724		
Year 2007 Dummy	Y07		-10.2625	2.5094 ***				
Year 2008 Dummy	Y08		-9.5053	2.5504 ***			-3.1017	0.9952 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8696	0.0312 ***	0.8875	0.0347 ***	0.1800	0.2344
Observations			409		329		79	
Adjusted R-squared			0.7943		0.7848		0.6011	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 27: Return on Equity (ROE) Regressions for Regional BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROE	Std. Error	ROE	Std. Error	ROE	Std. Error
Activity diversification								
	C		-0.0886	0.1305	0.1981	0.0789 **	-0.3149	2.1800
Domestic Geographic Div. (DGD)	H2	?	0.1047	0.0814	-0.0039	0.0382	-0.0598	0.7537
Loan Div. (LD)	H3	?	0.1587	0.1498	-0.0411	0.0502	1.7868	1.7709
Security Div. (SD)	H4	?	0.0550	0.0721	-0.0217	0.0417	-0.8293	0.7838
Non-interest-income Div. (NIID)	H5	?	0.0240	0.0216	0.0277	0.0148 *	-0.4243	0.3263
Off-balance-sheet Div. (OBSD)	H6	?	0.0023	0.0372	-0.0229	0.0203	-0.5771	0.4365
Scale variables								
Deposit Ratio	S2	+	0.0005	0.0568	0.0281	0.0181	-0.3663	0.2600
Loan Ratio	S3	+	0.2425	0.1791	-0.0102	0.0385	1.7268	1.5933
Security Ratio	S4	+	0.1867	0.1100 *	0.0321	0.0348	0.2063	0.9654
Non-interest-income Ratio	S5	+	0.0090	0.7903	0.4583	0.5891	-37.2095	51.1764
Off-balance-sheet Ratio	S6	?	-0.0141	0.0130	-0.0158	0.0064 **	-0.2081	0.2126
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.1616	0.1093	-0.0862	0.0571	0.2038	0.6558
Loan Div. (LD)	H3*S3	?	-0.2199	0.1804	0.0676	0.0712	-2.5832	2.4547
Security Div. (SD)	H4*S4	?	-0.0699	0.1761	0.0678	0.0907	-0.0751	2.1979
Non-interest-income Div. (NIID)	H5*S5	?	3.9281	2.9872	1.5320	1.0823	63.7505	80.0447
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0425	0.0237 *	0.0295	0.0104 ***	0.3847	0.3445
Activity interaction								
DGD * LD	H2*H3	?	-0.0433	0.1041	0.0910	0.0400 **	-0.4873	0.7401
DGD * NIID	H2*H5	?	0.0015	0.0704	0.0368	0.0372	1.1611	1.0037
SD * OBSD	H4*H6	?	-0.0565	0.0896	0.0071	0.0542	1.4273	1.0747
All Activities	H2*H3*H4*H5*H6	?	0.1823	0.1816	0.0073	0.0965	-4.7176	3.1163
Control variables								
International Loan Activity Dummy	ILAD		0.0144	0.0087 *	0.0055	0.0041	0.1224	0.0708 *
Log Asset	C1	?	-0.0203	0.0254	-0.0228	0.0103 **	-0.0555	0.3262
Equity Ratio	C2	?	0.5620	0.5460	-0.2155	0.0918 **	3.3303	2.6206
Asset Growth	C3	+	-0.0014	0.0207	-0.0217	0.0080 ***	0.6313	0.5739
Merger Dummy	C4	?	0.0065	0.0072	-0.0008	0.0025	0.0577	0.0443
Merger * Asset Growth	C4*C3	?	-0.0237	0.0445	-0.0275	0.0350	-0.8265	0.6328
Year 1999 Dummy	Y99		0.0102	0.0104	0.0097	0.0052 *		
Year 2000 Dummy	Y00		0.0053	0.0113	0.0057	0.0055		
Year 2001 Dummy	Y01		-0.0207	0.0124 *	-0.0093	0.0053 *		
Year 2002 Dummy	Y02		-0.0125	0.0118	-0.0027	0.0054		
Year 2003 Dummy	Y03		-0.0111	0.0127	-0.0012	0.0056		
Year 2004 Dummy	Y04		-0.0115	0.0136	0.0000	0.0058		
Year 2005 Dummy	Y05		-0.0120	0.0144	0.0011	0.0060		
Year 2006 Dummy	Y06		-0.0193	0.0149	-0.0020	0.0063		
Year 2007 Dummy	Y07		-0.0405	0.0172 **				
Year 2008 Dummy	Y08		-0.0879	0.0266 ***			-0.0546	0.0202 ***
First-order Coefficient of Autocorrelation	AR(1)		0.0554	0.0981	0.1478	0.0717 **	-0.2222	0.1535
Observations			409		329		79	
Adjusted R-squared			0.2586		0.3962		0.2037	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 28: Risk Adjusted Return on Equity (RAROE) Regressions for Regional BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROE	Std. Error	RAROE	Std. Error	RAROE	Std. Error
Activity diversification								
	C		-19.9227	33.9269	-16.2979	36.9625	-37.0956	66.6432
Domestic Geographic Div. (DGD)	H2	?	32.0934	14.5231 **	34.6007	19.0184 *	-13.5912	20.2473
Loan Div. (LD)	H3	?	32.6311	21.3575	53.0765	27.3996 *	-23.1401	36.9779
Security Div. (SD)	H4	?	-21.4558	12.2629 *	-25.3459	13.7108 *	-15.7878	21.2361
Non-interest-income Div. (NIID)	H5	?	7.4818	4.6013	5.5229	6.1281	-7.0711	6.1328
Off-balance-sheet Div. (OBSD)	H6	?	5.3864	6.7658	5.7980	7.2787	-12.5303	16.2564
Scale variables								
Deposit Ratio	S2	+	4.9061	7.5293	6.8437	9.6618	5.8561	6.7590
Loan Ratio	S3	+	32.2078	18.3884 *	31.6849	19.6679	18.2054	29.9474
Security Ratio	S4	+	-14.6829	18.9724	-27.2530	21.3732	11.6726	23.8486
Non-interest-income Ratio	S5	?	165.1023	128.2641	83.6498	167.9826	-150.6928	905.2455
Off-balance-sheet Ratio	S6	?	1.4387	3.1788	2.6568	4.1583	16.3361	4.3633 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-15.9840	13.1170	-15.4061	20.2478	-9.0746	16.7576
Loan Div. (LD)	H3*S3	?	-49.7139	31.6258	-77.1311	40.6434 *	18.5007	53.0236
Security Div. (SD)	H4*S4	?	144.3751	57.2575 **	167.9160	65.1185 **	34.4160	54.8063
Non-interest-income Div. (NIID)	H5*S5	?	-239.9717	358.1734	-289.6403	476.6733	924.0254	1383.3530
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.3893	5.0983	-2.7042	6.6825	-17.7129	6.8897 **
Activity interaction								
DGD * LD	H2*H3	?	-6.7573	19.6381	-6.5085	26.4477	-22.5366	24.5929
DGD * NIID	H2*H5	?	-28.0217	14.0551 **	-37.2144	18.3117 **	45.7748	29.8346
SD * OBSD	H4*H6	?	-8.0373	11.2060	-6.1834	13.0594	23.1043	30.2343
All Activities	H2*H3*H4*H5*H6	?	20.4965	60.8799	1.0615	75.4521	-35.2080	56.9757
Control variables								
International Loan Activity Dummy	ILAD	+	-0.1276	5.5632	1.0138	7.6156	1.8019	1.4429
Log Asset	C1	?	-0.1113	3.7392	-1.4318	4.4439	4.3034	8.3272
Equity Ratio	C2	?	31.0688	30.5368	89.1122	57.8887	5.8245	27.9335
Asset Growth	C3	+	-0.3900	1.5426	-0.4901	1.7745	-1.6737	10.7229
Merger Dummy	C4	?	0.2349	0.6060	0.6729	0.6874	0.3300	1.6126
Merger * Asset Growth	C4*C3	?	-0.4403	4.3927	-6.9817	4.2887	1.7681	12.7624
Year 1999 Dummy	Y99		-0.0014	0.8473	0.8030	0.8850		
Year 2000 Dummy	Y00		-1.1033	1.6351	0.6176	1.7153		
Year 2001 Dummy	Y01		-5.9593	2.3962 **	-1.8355	2.8639		
Year 2002 Dummy	Y02		-6.7598	2.2248 ***	-2.3356	2.7460		
Year 2003 Dummy	Y03		-7.3816	2.3312 ***	-2.3053	3.0713		
Year 2004 Dummy	Y04		-7.0786	2.4852 ***	-1.5549	3.1459		
Year 2005 Dummy	Y05		-6.7028	2.3439 ***	-0.5380	3.0437		
Year 2006 Dummy	Y06		-8.0098	2.4116 ***	-1.2574	3.0632		
Year 2007 Dummy	Y07		-10.5532	2.5139 ***				
Year 2008 Dummy	Y08		-9.8305	2.4868 ***			-3.3422	0.7172 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8413	0.0532 ***	0.8589	0.0540 ***	-0.3495	0.1408 **
Observations			409		329		79	
Adjusted R-squared			0.7836		0.7674		0.7071	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 29: Stock Return (SR) Regressions for Regional BHCs

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	SR	Std. Error	SR	Std. Error	SR	Std. Error
Activity diversification								
	C		-0.6655	0.6836	-1.3403	0.6680 **	20.225	5.46251 ***
Domestic Geographic Div. (DGD)	H2	?	0.5900	0.3176 *	0.7857	0.3129 **	1.2203	1.76914
Loan Div. (LD)	H3	?	0.0883	0.2995	-0.3199	0.3549	-2.29	3.83353
Security Div. (SD)	H4	?	0.2426	0.2506	0.1775	0.2910	2.8186	2.10953
Non-interest-income Div. (NIID)	H5	?	0.2409	0.1264 *	0.3059	0.1119 ***	-0.048	0.88474
Off-balance-sheet Div. (OBSD)	H6	?	-0.0454	0.1564	-0.2004	0.1890	0.4758	1.48611
Scale variables								
Deposit Ratio	S2	+	0.3048	0.1846 *	0.6047	0.1395 ***	0.3655	0.63163
Loan Ratio	S3	+	0.8360	0.3200 ***	0.8778	0.3228 ***	-3.05	3.6759
Security Ratio	S4	+	0.9209	0.4246 **	1.08	0.4968 **	3.8662	2.2153 *
Non-interest-income Ratio	S5	+	9.8659	5.3731 *	11.83	4.5447 ***	-26.16	104.006
Off-balance-sheet Ratio	S6	?	-0.0415	0.0724	-0.1074	0.0871	-1.266	0.32119 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.5040	0.4000	-0.9679	0.3511 ***	-2.727	1.50885 *
Loan Div. (LD)	H3*S3	?	-0.3429	0.3993	0.0394	0.4929	6.4684	5.61648
Security Div. (SD)	H4*S4	?	-0.5659	0.7925	-0.5478	0.9001	-12.74	5.50257 **
Non-interest-income Div. (NIID)	H5*S5	?	-14.2992	8.8701	-20.831	8.0405 **	31.079	156.157
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.1716	0.1240	0.3282	0.1438 **	1.9217	0.5292 ***
Activity interaction								
DGD * LD	H2*H3	?	0.0051	0.2736	0.2479	0.2951	5.2748	2.15665 **
DGD * NIID	H2*H5	?	-0.4984	0.2800 *	-0.4588	0.2931	-2.729	2.27002
SD * OBSD	H4*H6	?	-0.0583	0.2895	0.1865	0.3714	-3.247	3.017
All Activities	H2*H3*H4*H5*H6	?	0.0251	0.6614	-0.3853	0.7101	6.1775	5.49587
Control variables								
International Loan Activity Dummy	ILAD		-0.0153	0.0340	-0.046	0.0344	0.1149	0.16208
Log Asset	C1	?	-0.0349	0.0873	0.0498	0.0871	-2.745	0.65838 ***
Equity Ratio	C2	?	0.7029	0.7356	-0.101	0.6880	9.7937	3.23695 ***
Asset Growth	C3	+	0.1136	0.0994	0.1168	0.0951	-0.749	0.8599
Merger Dummy	C4	?	-0.0431	0.0354	-0.0746	0.0401 *	-0.033	0.13001
Merger * Asset Growth	C4*C3	?	-0.0994	0.2845	0.5518	0.3691	0.844	0.90697
Year 1999 Dummy	Y99		-0.1808	0.0473 ***	-0.2233	0.0388 ***		
Year 2000 Dummy	Y00		-0.0934	0.0534 *	-0.1439	0.0482 ***		
Year 2001 Dummy	Y01		-0.1873	0.0578 ***	-0.2645	0.0455 ***		
Year 2002 Dummy	Y02		-0.2085	0.0520 ***	-0.2688	0.0409 ***		
Year 2003 Dummy	Y03		-0.1055	0.0535 **	-0.1738	0.0445 ***		
Year 2004 Dummy	Y04		-0.1726	0.0535 ***	-0.2451	0.0451 ***		
Year 2005 Dummy	Y05		-0.2052	0.0563 ***	-0.2945	0.0469 ***		
Year 2006 Dummy	Y06		-0.1826	0.0586 ***	-0.2722	0.0491 ***		
Year 2007 Dummy	Y07		-0.2874	0.0632 ***				
Year 2008 Dummy	Y08		-0.3039	0.0851 ***			-0.025	0.03723
First-order Coefficient of Autocorrelation	AR(1)		-0.2936	0.0828 ***	-0.1577	0.0684 **	-0.685	0.12687 ***
Observations			409		329		79	
Adjusted R-squared			0.2142		0.1823		0.3913	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 30: Risk Adjusted Stock Return (RASR) Regressions for Regional BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RASR	Std. Error	RASR	Std. Error	RASR	Std. Error
Activity diversification								
	C		-6.0397	4.5494	-8.4840	3.9660 **	134.4	37.9676 ***
Domestic Geographic Div. (DGD)	H2	?	3.1226	2.2141	5.3683	2.0845 **	12.535	12.6409
Loan Div. (LD)	H3	?	1.3072	2.1831	-0.8314	2.2893	-24.15	29.446
Security Div. (SD)	H4	?	1.2784	1.6129	1.0967	1.6383	20.368	16.6182
Non-interest-income Div. (NIID)	H5	?	1.4488	0.7746 *	1.5178	0.7404 **	4.3709	4.84839
Off-balance-sheet Div. (OBSD)	H6	?	-0.6498	1.0392	-1.1371	1.0646	9.537	10.0734
Scale variables								
Deposit Ratio	S2	+	1.7217	1.1605	3.2136	0.9495 ***	3.6584	4.50492
Loan Ratio	S3	+	6.3465	2.0029 ***	6.1661	2.0601 ***	-26.22	27.595
Security Ratio	S4	+	6.7411	2.8371 **	7.891	2.9309 ***	9.2233	19.4973
Non-interest-income Ratio	S5	?	70.3044	36.1496 *	68.833	32.1492 **	377.58	648.5
Off-balance-sheet Ratio	S6	?	-0.1557	0.4750	-0.396	0.4948	-7.349	2.57697 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-1.3208	2.6620	-3.9497	2.2903 *	-16.67	10.5281
Loan Div. (LD)	H3*S3	?	-3.6929	3.0665	-0.8323	3.1921	53.105	41.9582
Security Div. (SD)	H4*S4	?	-3.8357	5.3332	-5.2972	5.3692	-50.95	46.9046
Non-interest-income Div. (NIID)	H5*S5	?	-109.6352	61.6798 *	-116.89	54.4211 **	-726.7	1005.42
Off-balance-sheet Div. (OBSD)	H6*S6	?	1.1291	0.7971	1.6381	0.8180 **	10.696	4.16461 **
Activity interaction								
DGD * LD	H2*H3	?	-0.7466	2.1572	-1.4855	2.1031	40.492	17.1833 **
DGD * NIID	H2*H5	?	-3.4354	1.9329 *	-3.3428	1.8958 *	-33.05	18.5612 *
SD * OBSD	H4*H6	?	0.6041	1.9614	1.2226	2.0508	-30.02	22.8261
All Activities	H2*H3*H4*H5*H6	?	-2.1067	5.3857	-3.5067	5.1678	57.067	42.8599
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0793	0.2602	-0.3161	0.2400	0.1207	1.27824
Log Asset	C1	?	0.0310	0.5797	0.3117	0.5092	-18.3	5.00802 ***
Equity Ratio	C2	?	4.1929	5.0187	1.6796	4.6565	60.049	19.6022 ***
Asset Growth	C3	+	0.4192	0.5143	0.7806	0.5178	-4.722	7.06402
Merger Dummy	C4	?	-0.2112	0.2667	-0.5294	0.2729 *	-0.205	0.93159
Merger * Asset Growth	C4*C3	?	-1.2324	2.6527	4.7041	2.5475 *	4.4191	7.41888
Year 1999 Dummy	Y99		-1.6571	0.2919 ***	-1.7978	0.2863 ***		
Year 2000 Dummy	Y00		-1.1948	0.3083 ***	-1.3491	0.3001 ***		
Year 2001 Dummy	Y01		-1.7143	0.3347 ***	-1.9174	0.3094 ***		
Year 2002 Dummy	Y02		-1.8585	0.3082 ***	-2.0097	0.2905 ***		
Year 2003 Dummy	Y03		-1.0875	0.3335 ***	-1.2168	0.3134 ***		
Year 2004 Dummy	Y04		-1.5085	0.3435 ***	-1.6730	0.3201 ***		
Year 2005 Dummy	Y05		-1.8615	0.3596 ***	-2.0870	0.3306 ***		
Year 2006 Dummy	Y06		-1.5137	0.3785 ***	-1.7358	0.3597 ***		
Year 2007 Dummy	Y07		-2.7079	0.4090 ***				
Year 2008 Dummy	Y08		-2.5941	0.4906 ***			0.2845	0.27989
First-order Coefficient of Autocorrelation	AR(1)		-0.2032	0.0582 ***	-0.2103	0.0590 ***	-0.517	0.11262 ***
Observations			409		329		79	
Adjusted R-squared			0.2400		0.2081		0.2934	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



# Appendix 31: Net Charge Off (NCO) Regressions for Regional BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			NCO	Std. Error	NCO	Std. Error	NCO	Std. Error
Activity diversification								
	C		-0.0004	0.0056	-0.0070	0.0024 ***	0.0352	0.0764
Domestic Geographic Div. (DGD)	H2	?	-0.0001	0.0035	-0.0008	0.0024	0.0015	0.0219
Loan Div. (LD)	H3	?	-0.0055	0.0058	0.0034	0.0012 ***	-0.0950	0.0548 *
Security Div. (SD)	H4	?	-0.0033	0.0017 *	0.0000	0.0005	0.0071	0.0179
Non-interest-income Div. (NIID)	H5	?	-0.0012	0.0009	-0.0010	0.0005 **	0.0092	0.0087
Off-balance-sheet Div. (OBSD)	H6	?	-0.0006	0.0015	-0.0001	0.0005	0.0123	0.0123
Scale variables								
Deposit Ratio	S2	-	0.0016	0.0020	-0.0005	0.0005	0.0107	0.0074
Loan Ratio	S3	?	-0.0065	0.0050	0.0020	0.0011 *	-0.0810	0.0435 *
Security Ratio	S4	?	-0.0084	0.0034 **	-0.0006	0.0014	0.0145	0.0309
Non-interest-income Ratio	S5	?	-0.1005	0.0288 ***	-0.0914	0.0254 ***	0.9311	1.2085
Off-balance-sheet Ratio	S6	?	0.0008	0.0004 *	0.0002	0.0002	0.0073	0.0057
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0002	0.0046	0.0031	0.0023	-0.0243	0.0213
Loan Div. (LD)	H3*S3	?	0.0094	0.0069	-0.0033	0.0019 *	0.1372	0.0764 *
Security Div. (SD)	H4*S4	?	0.0108	0.0050 **	0.0037	0.0021 *	-0.0157	0.0594
Non-interest-income Div. (NIID)	H5*S5	?	0.2033	0.1075 *	0.1569	0.0450 ***	-1.0922	1.9367
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0021	0.0008 ***	-0.0003	0.0004	-0.0129	0.0092
Activity interaction								
DGD * LD	H2*H3	?	0.0010	0.0048	-0.0038	0.0013 ***	0.0183	0.0269
DGD * NIID	H2*H5	?	0.0013	0.0027	0.0020	0.0022	-0.0204	0.0278
SD * OBSD	H4*H6	?	0.0032	0.0027	0.0004	0.0008	-0.0139	0.0245
All Activities	H2*H3*H4*H5*H6	?	-0.0137	0.0111	-0.0133	0.0076 *	0.1547	0.1060
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0008	0.0004 **	0.0000	0.0002	-0.0031	0.0017 *
Log Asset	C1	?	0.0009	0.0010	0.0009	0.0003 ***	0.0005	0.0106
Equity Ratio	C2	?	-0.0108	0.0184	-0.0032	0.0030	-0.0193	0.0696
Asset Growth	C3	+	-0.0004	0.0004	-0.0001	0.0001	-0.0244	0.0166
Merger Dummy	C4	?	-0.0002	0.0002	-0.0001	0.0001	-0.0019	0.0012
Merger * Asset Growth	C4*C3	?	-0.0011	0.0024	0.0017	0.0012	0.0287	0.0181
Year 1999 Dummy	Y99		0.0005	0.0004	0.0000	0.0001		
Year 2000 Dummy	Y00		0.0005	0.0004	0.0000	0.0001		
Year 2001 Dummy	Y01		0.0012	0.0005 **	0.0005	0.0002 ***		
Year 2002 Dummy	Y02		0.0013	0.0005 ***	0.0006	0.0002 ***		
Year 2003 Dummy	Y03		0.0011	0.0005 **	0.0004	0.0002 **		
Year 2004 Dummy	Y04		0.0008	0.0005	0.0001	0.0002		
Year 2005 Dummy	Y05		0.0006	0.0005	-0.0001	0.0002		
Year 2006 Dummy	Y06		0.0007	0.0006	-0.0001	0.0002		
Year 2007 Dummy	Y07		0.0015	0.0007 **				
Year 2008 Dummy	Y08		0.0033	0.0008 ***			0.0019	0.0007 **
First-order Coefficient of Autocorrelation	AR(1)		0.2083	0.1219 *	0.3575	0.1118 ***	-0.2406	0.1254 *
Observations			409		329		79	
Adjusted R-squared			0.3576		0.6630		0.2490	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 32: Maturity Gap (MG) Regressions for Regional BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MG	Std. Error	MG	Std. Error	MG	Std. Error
Activity diversification								
	C		0.6322	0.6045	0.5453	0.7380	-1.5580	1.8332
Domestic Geographic Div. (DGD)	H2	?	0.9364	0.2656 ***	0.7678	0.2846 ***	1.0136	0.5786 *
Loan Div. (LD)	H3	?	0.9617	0.2760 ***	1.2797	0.3302 ***	1.1044	0.9130
Security Div. (SD)	H4	?	0.2035	0.1344	0.1295	0.1344	-1.0492	0.7278
Non-interest-income Div. (NIID)	H5	?	0.0557	0.0714	0.0308	0.0772	0.2354	0.2127
Off-balance-sheet Div. (OBSD)	H6	?	0.0614	0.0975	0.0235	0.1022	-0.5367	0.4962
Scale variables								
Deposit Ratio	S2	-	-0.2228	0.1270 *	-0.2215	0.1361	-0.2914	0.3163
Loan Ratio	S3	?	0.3132	0.2694	0.4683	0.2854	0.8342	0.8014
Security Ratio	S4	?	0.4365	0.2239 *	0.2541	0.2521	0.4130	1.0583
Non-interest-income Ratio	S5	?	-3.0147	2.4964	-5.3805	2.9840 *	36.2741	20.7321 *
Off-balance-sheet Ratio	S6	?	-0.0968	0.0584 *	-0.0771	0.0608	-0.0096	0.1572
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.2978	0.2355	0.2248	0.3134	0.5219	0.5218
Loan Div. (LD)	H3*S3	?	-1.1174	0.3908 ***	-1.6577	0.4990 ***	-1.6416	1.2355
Security Div. (SD)	H4*S4	?	-1.3805	0.5664 **	-0.3570	0.5783	-0.5184	2.2932
Non-interest-income Div. (NIID)	H5*S5	?	11.3095	7.7711	18.2519	9.6566 *	#####	32.9244
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.1425	0.0903	0.1328	0.0927	0.0113	0.2403
Activity interaction								
DGD * LD	H2*H3	?	-1.3623	0.2879 ***	-0.9298	0.3937 **	-2.9281	0.6343 ***
DGD * NIID	H2*H5	?	-0.6106	0.2016 ***	-0.5556	0.2214 **	-0.0621	0.5641
SD * OBSD	H4*H6	?	-0.1404	0.1653	-0.1062	0.1622	1.4612	0.9391
All Activities	H2*H3*H4*H5*H6	?	1.1377	0.5388 **	0.8383	0.6252	2.4150	1.7407
Control variables								
International Loan Activity Dummy	ILAD	+	0.1863	0.0493 ***	0.3347	0.0997 ***	0.0346	0.0531
Log Asset	C1	?	-0.0898	0.0798	-0.0947	0.0936	0.2218	0.2409
Equity Ratio	C2	?	-0.4876	0.6029	0.1185	0.7528	-1.3944	1.0370
Asset Growth	C3	+	0.0026	0.0249	0.0062	0.0244	-0.0537	0.2623
Merger Dummy	C4	?	-0.0042	0.0080	-0.0019	0.0107	-0.0206	0.0190
Merger * Asset Growth	C4*C3	?	-0.0329	0.0540	-0.0795	0.1327	0.0278	0.2730
Year 1999 Dummy	Y99		-0.0398	0.0223 *	-0.0472	0.0211 **		
Year 2000 Dummy	Y00		-0.0392	0.0302	-0.0470	0.0257 *		
Year 2001 Dummy	Y01		-0.0218	0.0426	-0.0423	0.0400		
Year 2002 Dummy	Y02		-0.0005	0.0471	-0.0307	0.0408		
Year 2003 Dummy	Y03		0.0160	0.0527	-0.0232	0.0471		
Year 2004 Dummy	Y04		0.0186	0.0578	-0.0227	0.0513		
Year 2005 Dummy	Y05		0.0069	0.0617	-0.0325	0.0543		
Year 2006 Dummy	Y06		-0.0051	0.0634	-0.0470	0.0571		
Year 2007 Dummy	Y07		-0.0203	0.0667				
Year 2008 Dummy	Y08		-0.0110	0.0706			0.0282	0.0192
First-order Coefficient of Autocorrelation	AR(1)		0.7967	0.0483 ***	0.9040	0.0342 ***	0.3487	0.1851 *
Observations			409		329		79	
Adjusted R-squared			0.7743		0.7799		0.7006	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 33: Derivatives Loss (DL) Regressions for Regional BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			DL	Std. Error	DL	Std. Error	DL	Std. Error
Activity diversification								
	C		-0.0001	0.0001	-0.0001	0.0001	0.0000	0.0014
Domestic Geographic Div. (DGD)	H2	?	0.0001	0.0000 **	0.0000	0.0000	0.0003	0.0004
Loan Div. (LD)	H3	?	0.0000	0.0001	0.0000	0.0000	-0.0002	0.0008
Security Div. (SD)	H4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
Non-interest-income Div. (NIID)	H5	?	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002
Off-balance-sheet Div. (OBSD)	H6	?	0.0000	0.0000	0.0000	0.0000	0.0002	0.0003
Scale variables								
Deposit Ratio	S2	-	0.0000	0.0000 *	0.0000	0.0000	0.0002	0.0002
Loan Ratio	S3	?	0.0001	0.0000	0.0000	0.0000	0.0000	0.0007
Security Ratio	S4	?	0.0000	0.0001	0.0000	0.0000	0.0002	0.0007
Non-interest-income Ratio	S5	?	-0.0005	0.0008	-0.0002	0.0002	-0.0052	0.0206
Off-balance-sheet Ratio	S6	?	0.0000	0.0000	0.0000	0.0000 *	0.0000	0.0001
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0001	0.0001 *	0.0000	0.0000	-0.0006	0.0004
Loan Div. (LD)	H3*S3	?	0.0000	0.0001	0.0000	0.0000	0.0001	0.0011
Security Div. (SD)	H4*S4	?	0.0001	0.0001	0.0000	0.0000	0.0001	0.0016
Non-interest-income Div. (NIID)	H5*S5	?	0.0003	0.0016	-0.0006	0.0005	0.0118	0.0309
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0000	0.0000	0.0000	0.0000 **	0.0000	0.0002
Activity interaction								
DGD * LD	H2*H3	?	0.0000	0.0001	0.0000	0.0000	0.0002	0.0005
DGD * NIID	H2*H5	?	-0.0001	0.0000	0.0000	0.0000	-0.0001	0.0006
SD * OBSD	H4*H6	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006
All Activities	H2*H3*H4*H5*H6	?	0.0000	0.0001	0.0000	0.0000	-0.0002	0.0014
Control variables								
International Loan Activity Dummy	ILAD	+	0.0000	0.0000 ***	0.0000	0.0000 **	0.0000	0.0000
Log Asset	C1	?	0.0000	0.0000	0.0000	0.0000	-0.0001	0.0002
Equity Ratio	C2	?	0.0004	0.0001 ***	0.0000	0.0000	0.0018	0.0007 **
Asset Growth	C3	+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
Merger Dummy	C4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger * Asset Growth	C4*C3	?	0.0000	0.0000	0.0000	0.0000	-0.0001	0.0003
Year 1999 Dummy	Y99		0.0000	0.0000	0.0000	0.0000		
Year 2000 Dummy	Y00		0.0000	0.0000	0.0000	0.0000		
Year 2001 Dummy	Y01		0.0000	0.0000	0.0000	0.0000		
Year 2002 Dummy	Y02		0.0000	0.0000	0.0000	0.0000 *		
Year 2003 Dummy	Y03		0.0000	0.0000	0.0000	0.0000		
Year 2004 Dummy	Y04		0.0000	0.0000	0.0000	0.0000		
Year 2005 Dummy	Y05		0.0000	0.0000	0.0000	0.0000		
Year 2006 Dummy	Y06		0.0000	0.0000	0.0000	0.0000		
Year 2007 Dummy	Y07		0.0000	0.0000				
Year 2008 Dummy	Y08		0.0000	0.0000			0.0000	0.0000
First-order Coefficient of Autocorrelation	AR(1)		0.0851	0.0573	0.2591	0.1680	-0.0539	0.1569
Observations			409		329		79	
Adjusted R-squared			0.0596		0.2539		-0.0693	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 34: Market Beta (MB) Regressions for Regional BHCs

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	MB	Std. Error	MB	Std. Error	MB	Std. Error
Activity diversification								
	C		-0.9318	1.3092	-0.8974	0.6740	12.386	4.91913 **
Domestic Geographic Div. (DGD)	H2	?	0.1583	0.7007	-0.2947	0.2410	-0.6088	2.08755
Loan Div. (LD)	H3	?	-1.4669	0.5879 **	0.3878	0.3520	-5.8761	3.10325 *
Security Div. (SD)	H4	?	-0.0280	0.1585	0.131	0.0819	-0.384	1.82595
Non-interest-income Div. (NIID)	H5	?	-0.0453	0.1359	0.1252	0.0721 *	0.5456	0.92438
Off-balance-sheet Div. (OBSD)	H6	?	0.0531	0.1639	0.1512	0.0928	1.026	1.18523
Scale variables								
Deposit Ratio	S2	-	-0.2388	0.1882	-0.0512	0.0822	-1.7568	0.71316 **
Loan Ratio	S3	?	-0.7313	0.4486	0.0519	0.2702	-7.2854	2.71241 ***
Security Ratio	S4	?	-0.4340	0.2698	-0.1061	0.1836	-3.0703	2.58645
Non-interest-income Ratio	S5	?	0.6254	3.3820	-0.8019	1.9475	-26.94	104.782
Off-balance-sheet Ratio	S6	?	0.0144	0.0937	0.0175	0.0638	0.9213	0.44216 **
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.7478	0.8844	-0.0604	0.2362	2.3294	1.69057
Loan Div. (LD)	H3*S3	?	1.9253	0.8888 **	-0.665	0.4911	10.772	4.44958 **
Security Div. (SD)	H4*S4	?	-2.2782	0.6501 ***	-0.9215	0.4622 **	-2.0854	6.10119
Non-interest-income Div. (NIID)	H5*S5	?	-9.3787	8.7055	6.2509	4.3656	-49.307	151.936
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0840	0.1402	0.0379	0.1053	-1.6649	0.69888 **
Activity interaction								
DGD * LD	H2*H3	?	1.4508	0.6571 **	0.783	0.3255 **	2.6647	2.08567
DGD * NIID	H2*H5	?	-0.5980	0.2975 **	-0.0658	0.1896	-5.2529	3.08391 *
SD * OBSD	H4*H6	?	0.0924	0.2324	0.0974	0.1348	-0.4191	2.29372
All Activities	H2*H3*H4*H5*H6	?	0.6483	1.0157	-1.4149	0.7215 *	14.374	6.25514 **
Control variables								
International Loan Activity Dummy	ILAD	+	-0.1349	0.1032	0.0318	0.0852	-0.2365	0.14322
Log Asset	C1	?	0.3579	0.1616 **	0.2099	0.0797 ***	-0.7869	0.6247
Equity Ratio	C2	?	-1.8382	1.0992 *	1.3363	0.6041 **	2.0349	3.60826
Asset Growth	C3	+	-0.1126	0.0433 ***	-0.0646	0.0250 **	-0.8467	1.22402
Merger Dummy	C4	?	0.0007	0.0151	0.0062	0.0086	-0.0764	0.10619
Merger * Asset Growth	C4*C3	?	-0.0218	0.1425	-0.1479	0.0723 **	0.9188	1.30854
Year 1999 Dummy	Y99		0.0423	0.0274	-0.0143	0.0158		
Year 2000 Dummy	Y00		0.1035	0.0372 ***	0.0176	0.0210		
Year 2001 Dummy	Y01		0.1777	0.0549 ***	-0.0642	0.0302 **		
Year 2002 Dummy	Y02		0.1885	0.0558 ***	-0.0725	0.0312 **		
Year 2003 Dummy	Y03		0.2123	0.0644 ***	-0.1110	0.0338 ***		
Year 2004 Dummy	Y04		0.2405	0.0711 ***	-0.1181	0.0358 ***		
Year 2005 Dummy	Y05		0.2463	0.0786 ***	-0.1354	0.0372 ***		
Year 2006 Dummy	Y06		0.2995	0.0846 ***	-0.1461	0.0391 ***		
Year 2007 Dummy	Y07		0.3692	0.0953 ***				
Year 2008 Dummy	Y08		0.5530	0.0965 ***			0.4649	0.06827 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8494	0.0423 ***	0.9419	0.0200 ***	-0.161	0.17256
Observations			409		329		79	
Adjusted R-squared			0.8540		0.9586		0.6115	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 35: Interest Rate Beta (IRB) Regressions for Regional BHCs**

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	IRB	Std. Error	IRB	Std. Error	IRB	Std. Error
Activity diversification								
	C		-0.1998	0.6303	0.5704	0.5300	-1.914	3.09852
Domestic Geographic Div. (DGD)	H2	?	-0.9318	0.2724 ***	-0.69725	0.3016 **	-3.075	1.027 ***
Loan Div. (LD)	H3	?	-0.4108	0.3640	-1.13915	0.3171 ***	-2.633	1.70529
Security Div. (SD)	H4	?	0.0551	0.1561	-0.04018	0.1102	0.3489	1.22491
Non-interest-income Div. (NIID)	H5	?	-0.1006	0.1069	-0.05175	0.0639	-0.785	0.58248
Off-balance-sheet Div. (OBSD)	H6	?	-0.0728	0.1232	-0.14161	0.1040	0.8432	0.77025
Scale variables								
Deposit Ratio	S2	-	0.0049	0.1547	-0.05351	0.0930	-0.303	0.44188
Loan Ratio	S3	?	-0.4039	0.3071	-0.61764	0.2342 ***	-1.202	1.49304
Security Ratio	S4	?	-0.1722	0.3313	-0.23107	0.2362	-1.284	1.72681
Non-interest-income Ratio	S5	?	-4.5917	2.9663	-1.12567	2.1450	-73.16	79.5835
Off-balance-sheet Ratio	S6	?	-0.0426	0.0549	-0.07629	0.0671	0.6522	0.31598 **
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.4568	0.3666	0.31177	0.2994	0.554	1.00724
Loan Div. (LD)	H3*S3	?	0.2796	0.5066	1.28076	0.4566 ***	2.6156	2.43662
Security Div. (SD)	H4*S4	?	-0.2581	0.6121	0.35799	0.4842	1.8501	3.90762
Non-interest-income Div. (NIID)	H5*S5	?	2.7777	6.6376	3.07435	6.2592	79.156	113.197
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0916	0.0875	0.15293	0.0998	-0.843	0.4737 *
Activity interaction								
DGD * LD	H2*H3	?	0.7850	0.3252 **	1.07508	0.3463 ***	1.9096	1.19401
DGD * NIID	H2*H5	?	0.4185	0.2674	-0.06641	0.2169	2.343	1.37727 *
SD * OBSD	H4*H6	?	0.0754	0.1900	0.08335	0.1543	-0.186	1.55039
All Activities	H2*H3*H4*H5*H6	?	-0.3616	0.6620	0.46752	0.6854	-1.517	3.28246
Control variables								
International Loan Activity Dummy	ILAD	+	0.1021	0.0436 **	0.06544	0.0561	0.0275	0.07258
Log Asset	C1	?	0.1189	0.0767	0.05296	0.0670	0.4663	0.41216
Equity Ratio	C2	?	-1.4051	0.8046 *	-2.81528	0.6533 ***	-2.156	2.31878
Asset Growth	C3	+	-0.0424	0.0276	-0.01412	0.0216	-0.299	0.66937
Merger Dummy	C4	?	-0.0027	0.0151	0.01308	0.0147	0.0183	0.05368
Merger * Asset Growth	C4*C3	?	-0.0135	0.0646	-0.095	0.1241	0.1004	0.69843
Year 1999 Dummy	Y99		-0.0360	0.0187 *	-0.0148	0.0087 *		
Year 2000 Dummy	Y00		-0.1100	0.0327 ***	-0.0774	0.0269 ***		
Year 2001 Dummy	Y01		-0.1416	0.0377 ***	-0.1038	0.0333 ***		
Year 2002 Dummy	Y02		-0.1524	0.0381 ***	-0.1288	0.0319 ***		
Year 2003 Dummy	Y03		-0.0252	0.0408	-0.0308	0.0344		
Year 2004 Dummy	Y04		-0.0358	0.0411	-0.0370	0.0353		
Year 2005 Dummy	Y05		-0.0848	0.0424 **	-0.0672	0.0344 *		
Year 2006 Dummy	Y06		-0.1058	0.0388 ***	-0.0651	0.0339 *		
Year 2007 Dummy	Y07		-0.1059	0.0408 ***				
Year 2008 Dummy	Y08		-0.2080	0.0447 ***			-0.082	0.03122 **
First-order Coefficient of Autocorrelation	AR(1)		0.6522	0.0835 ***	0.8725	0.0356 ***	-0.185	0.17215
Observations			409		329		79	
Adjusted R-squared			0.6050		0.8026		0.2787	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 36: Distance to Default (Z-Score) Regressions for Regional BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			Z	Std. Error	Z	Std. Error	Z	Std. Error
Activity diversification								
	C		-1394.20	728.99 *	-234.34	821.99	-930.52	1461.50
Domestic Geographic Div. (DGD)	H2	?	576.24	319.52 *	1217.58	398.93 ***	-94.52	460.98
Loan Div. (LD)	H3	?	817.23	449.54 *	1534.27	563.85 ***	-523.70	781.31
Security Div. (SD)	H4	?	-456.09	197.91 **	-468.46	219.16 **	-545.60	490.61
Non-interest-income Div. (NIID)	H5	?	47.28	68.33	-79.86	104.61	-84.13	169.03
Off-balance-sheet Div. (OBSD)	H6	?	-102.61	138.46	-26.75	149.33	-135.01	279.14
Scale variables								
Deposit Ratio	S2	+	171.24	136.86	220.78	151.32	-24.45	166.71
Loan Ratio	S3	?	643.18	304.09 **	662.49	337.15 *	690.29	678.82
Security Ratio	S4	?	-450.32	327.43	-788.47	391.42 **	678.94	907.43
Non-interest-income Ratio	S5	?	1176.00	2240.41	-2267.00	3004.27	-1007.04	14470.52
Off-balance-sheet Ratio	S6	?	-16.02	71.26	10.93	92.15	404.56	113.70 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-458.89	274.18 *	-975.76	365.99 ***	-52.81	267.42
Loan Div. (LD)	H3*S3	?	-1091.70	561.99 *	-1869.44	728.11 **	261.14	1100.63
Security Div. (SD)	H4*S4	?	3157.85	1285.32 **	3788.70	1382.07 ***	991.94	1905.81
Non-interest-income Div. (NIID)	H5*S5	?	-13723.74	7196.07 *	-5717.51	9969.55	6474.81	21231.95
Off-balance-sheet Div. (OBSD)	H6*S6	?	69.49	111.08	0.98	145.96	-476.12	172.83 ***
Activity interaction								
DGD * LD	H2*H3	?	-163.85	479.99	-651.68	632.82	-438.77	840.71
DGD * NIID	H2*H5	?	-143.95	256.36	-114.71	310.63	293.96	386.17
SD * OBSD	H4*H6	?	113.97	217.29	51.84	228.96	750.05	576.00
All Activities	H2*H3*H4*H5*H6	?	-528.46	1045.87	-978.07	1182.81	190.36	1256.69
Control variables								
International Loan Activity Dummy	ILAD	-	-38.09	99.22	88.38	159.63	-23.24	44.42
Log Asset	C1	?	143.84	83.33 *	-72.60	98.13	93.91	205.43
Equity Ratio	C2	?	1249.19	516.81 **	4147.21	1197.56 ***	39.06	546.15
Asset Growth	C3	-	4.42	28.58	22.30	32.20	-34.70	185.45
Merger Dummy	C4	?	-0.50	13.23	12.68	15.72	-36.06	40.99
Merger * Asset Growth	C4*C3	?	67.02	101.24	-114.32	82.23	338.09	211.83
Year 1999 Dummy	Y99		-31.01	14.43 **	-6.66	13.98		
Year 2000 Dummy	Y00		-87.53	35.18 **	-31.02	34.63		
Year 2001 Dummy	Y01		-108.50	45.54 **	0.53	52.14		
Year 2002 Dummy	Y02		-143.45	46.30 ***	-24.47	52.26		
Year 2003 Dummy	Y03		-152.63	48.86 ***	-6.85	57.26		
Year 2004 Dummy	Y04		-152.34	52.39 ***	17.98	60.37		
Year 2005 Dummy	Y05		-164.40	53.29 ***	36.43	62.17		
Year 2006 Dummy	Y06		-196.49	56.93 ***	23.93	64.81		
Year 2007 Dummy	Y07		-219.73	58.36 ***				
Year 2008 Dummy	Y08		-236.72	60.25 ***			-50.07	19.78 **
First-order Coefficient of Autocorrelation	AR(1)		0.92	0.03 ***	0.93	0.02 ***	0.64	0.19 ***
Observations			409		329		79	
Adjusted R-squared			0.8444		0.8321		0.7321	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 37: Return on Asset (ROA) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROA	Std. Error	ROA	Std. Error	ROA	Std. Error
Activity diversification								
	C		0.0156	0.0077 **	0.0017	0.0070	0.0442	0.0215 **
Domestic Geographic Div. (DGD)	H2	?	0.0047	0.0082	0.0077	0.0062	-0.1504	0.0909
Loan Div. (LD)	H3	?	-0.0015	0.0015	-0.0008	0.0017	-0.0225	0.0150
Security Div. (SD)	H4	?	-0.0051	0.0057	0.0021	0.0042	-0.0102	0.0261
Non-interest-income Div. (NIID)	H5	?	-0.0019	0.0030	-0.0004	0.0027	-0.0087	0.0093
Off-balance-sheet Div. (OBSD)	H6	?	0.0048	0.0048	0.0040	0.0029	-0.0176	0.0188
Scale variables								
Deposit Ratio	S2	+	-0.0054	0.0027 **	-0.0021	0.0025	-0.0047	0.0088
Loan Ratio	S3	+	-0.0022	0.0034	-0.0036	0.0038	-0.0104	0.0119
Security Ratio	S4	+	-0.0153	0.0064 **	-0.0020	0.0056	0.0149	0.0179
Non-interest-income Ratio	S5	+	-0.5071	0.2873 *	-0.0345	0.2312	-0.4972	0.7488
Off-balance-sheet Ratio	S6	?	0.0001	0.0001	-0.0001	0.0001	-0.0006	0.0003 *
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0002	0.0042	-0.0022	0.0034	0.0604	0.0315 *
Loan Div. (LD)	H3*S3	?	0.0056	0.0043	0.0066	0.0049	0.0236	0.0243
Security Div. (SD)	H4*S4	?	0.0287	0.0101 ***	0.0031	0.0087	-0.0321	0.0300
Non-interest-income Div. (NIID)	H5*S5	?	0.5657	0.4091	-0.0127	0.3440	0.6522	1.0316
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0002	0.0002	0.0001	0.0002	0.0010	0.0005 *
Activity interaction								
DGD * LD	H2*H3	?	-0.0114	0.0083	-0.0118	0.0076	0.0924	0.1328
DGD * NIID	H2*H5	?	0.0002	0.0045	-0.0002	0.0044	0.0761	0.0429 *
SD * OBSD	H4*H6	?	-0.0058	0.0090	-0.0084	0.0059	0.0160	0.0407
All Activities	H2*H3*H4*H5*H6	?	0.0100	0.0102	0.0038	0.0122	0.0393	0.0723
Control variables								
International Loan Activity Dummy	ILAD		-0.0006	0.0007	-0.0006	0.0008	-0.0024	0.0041
Log Asset	C1	?	-0.0007	0.0007	0.0002	0.0008	-0.0003	0.0028
Equity Ratio	C2	?	0.0188	0.0180	0.0248	0.0115 **	-0.0621	0.0483
Asset Growth	C3	+	0.0008	0.0008	0.0007	0.0011	-0.0075	0.0042 *
Merger Dummy	C4	?	0.0001	0.0002	-0.0002	0.0003	0.0008	0.0006
Merger * Asset Growth	C4*C3	?	-0.0019	0.0011 *	-0.0009	0.0013	-0.0013	0.0053
Year 1999 Dummy	Y99		-0.0004	0.0004	0.0001	0.0005		
Year 2000 Dummy	Y00		-0.0009	0.0005 *	-0.0003	0.0005		
Year 2001 Dummy	Y01		-0.0018	0.0006 ***	-0.0012	0.0007 *		
Year 2002 Dummy	Y02		-0.0009	0.0007	-0.0004	0.0007		
Year 2003 Dummy	Y03		-0.0012	0.0008	-0.0005	0.0008		
Year 2004 Dummy	Y04		-0.0012	0.0008	-0.0006	0.0009		
Year 2005 Dummy	Y05		-0.0012	0.0008	-0.0005	0.0009		
Year 2006 Dummy	Y06		-0.0009	0.0008	-0.0002	0.0009		
Year 2007 Dummy	Y07		-0.0019	0.0009 **				
Year 2008 Dummy	Y08		-0.0032	0.0008 ***			-0.0013	0.0004 ***
First-order Coefficient of Autocorrelation	AR(1)		0.1681	0.0845 **	0.0423	0.0635	-0.1165	0.1543
Observations			368		296		71	
Adjusted R-squared			0.4233		0.3300		0.6503	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 38: Risk Adjusted Return on Asset (RAROA) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROA	Std. Error	RAROA	Std. Error	RAROA	Std. Error
Activity diversification								
	C		17.5244	34.9804	-4.3446	40.1579	183.5274	163.0675
Domestic Geographic Div. (DGD)	H2	?	-26.0506	31.9084	41.7676	26.1902	287.7356	214.7304
Loan Div. (LD)	H3	?	4.4642	7.3209	0.3024	9.2342	-63.8468	54.8867
Security Div. (SD)	H4	?	1.7073	23.9091	12.0343	24.7193	-125.8794	86.0068
Non-interest-income Div. (NIID)	H5	?	7.8811	8.1176	-6.9942	9.3385	-12.9160	38.6785
Off-balance-sheet Div. (OBSD)	H6	?	7.0662	18.0319	-1.5862	18.7740	-19.6819	95.1729
Scale variables								
Deposit Ratio	S2	+	14.5498	11.6563	21.2595	13.9003	-9.5893	31.4839
Loan Ratio	S3	+	3.2653	27.1206	-32.1276	31.9570	-74.1241	70.4696
Security Ratio	S4	+	-20.3378	17.2408	-49.7327	22.9170 **	-103.8229	75.4135
Non-interest-income Ratio	S5	?	512.7511	512.1356	924.3728	721.9704	-1677.1120	1900.8010
Off-balance-sheet Ratio	S6	?	-0.2897	0.2384	-1.0085	0.3825 ***	-0.4753	0.7966
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	26.0848	16.1852	7.7702	16.8286	79.8028	108.0813
Loan Div. (LD)	H3*S3	?	-24.2375	41.8409	55.6553	45.4616	139.5090	107.3364
Security Div. (SD)	H4*S4	?	18.7024	29.1570	67.5535	37.2677 *	78.1472	142.7040
Non-interest-income Div. (NIID)	H5*S5	?	-589.7878	840.9409	-934.4741	1203.9930	2806.4300	2628.1670
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.3096	0.4071	0.7864	0.5572	1.9233	1.5321
Activity interaction								
DGD * LD	H2*H3	?	24.4750	45.9402	-116.0786	35.5435 ***	-554.9807	389.4705
DGD * NIID	H2*H5	?	-4.2374	14.3487	13.7177	15.8155	-23.4742	114.6434
SD * OBSD	H4*H6	?	1.3483	35.7670	-22.2902	36.7310	154.4129	133.7668
All Activities	H2*H3*H4*H5*H6	?	26.1761	37.1250	59.8337	37.9941	69.2659	282.4360
Control variables								
International Loan Activity Dummy	ILAD	+	1.2663	5.3310	10.4244	6.5627	2.0682	19.2159
Log Asset	C1	?	-2.1328	4.2011	0.8460	5.0613	-11.1532	16.5159
Equity Ratio	C2	?	28.5401	39.9407	21.6711	58.5141	-58.2606	102.2462
Asset Growth	C3	+	0.9776	1.4154	-0.7450	1.2194	-4.4561	13.6026
Merger Dummy	C4	?	-0.2270	0.5389	-0.1460	0.5824	1.4057	1.5290
Merger * Asset Growth	C4*C3	?	-1.7677	2.7171	-4.0576	3.3016	2.6689	15.1532
Year 1999 Dummy	Y99		-2.2044	1.2876 *	-0.9941	1.1701		
Year 2000 Dummy	Y00		-4.0153	1.4821 ***	-1.3326	1.3898		
Year 2001 Dummy	Y01		-8.3316	2.6886 ***	-1.7744	2.6253		
Year 2002 Dummy	Y02		-8.7578	2.6999 ***	-1.1664	2.6538		
Year 2003 Dummy	Y03		-9.5760	2.8688 ***	-0.2782	2.8512		
Year 2004 Dummy	Y04		-9.1002	2.9148 ***	1.9138	3.0309		
Year 2005 Dummy	Y05		-7.3528	3.0906 **	5.0026	3.2275		
Year 2006 Dummy	Y06		-7.4335	3.1567 **	6.0949	3.1780 *		
Year 2007 Dummy	Y07		-10.6834	3.3925 ***				
Year 2008 Dummy	Y08		-10.7339	3.4610 ***			-5.4722	2.5633 **
First-order Coefficient of Autocorrelation	AR(1)		0.8881	0.0461 ***	0.9157	0.0242 ***	0.8523	0.0834 ***
Observations			368		296		71	
Adjusted R-squared			0.7518		0.7606		0.4265	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



**Appendix 39: Return on Equity (ROE) Regressions for Money Center BHCs**

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	ROE	Std. Error	ROE	Std. Error	ROE	Std. Error
Activity diversification								
	C		0.3541	0.1195 ***	0.0985	0.0724	0.5009	0.2406 **
Domestic Geographic Div. (DGD)	H2	?	0.0050	0.1111	0.0675	0.0891	-2.0301	1.1052 *
Loan Div. (LD)	H3	?	-0.0206	0.0220	-0.0019	0.0206	-0.2286	0.1831
Security Div. (SD)	H4	?	-0.0923	0.0686	-0.0082	0.0708	-0.1116	0.3039
Non-interest-income Div. (NIID)	H5	?	-0.0485	0.0429	-0.0175	0.0413	-0.1288	0.1061
Off-balance-sheet Div. (OBSD)	H6	?	0.0634	0.0569	0.0256	0.0633	-0.1478	0.2112
Scale variables								
Deposit Ratio	S2	+	-0.0921	0.0383 **	-0.0172	0.0276	-0.0735	0.0941
Loan Ratio	S3	+	-0.0064	0.0433	-0.0196	0.0418	-0.0702	0.1440
Security Ratio	S4	+	-0.2686	0.0959 ***	-0.0489	0.0567	0.0901	0.1765
Non-interest-income Ratio	S5	+	-10.3776	5.0521 **	-0.7798	3.1289	-9.5336	9.5409
Off-balance-sheet Ratio	S6	?	0.0023	0.0016	-0.0012	0.0014	-0.0050	0.0032
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0293	0.0598	-0.0388	0.0455	0.5878	0.3216 *
Loan Div. (LD)	H3*S3	?	0.0516	0.0567	0.0438	0.0501	0.2304	0.3003
Security Div. (SD)	H4*S4	?	0.4663	0.1538 ***	0.0663	0.0896	-0.1783	0.2966
Non-interest-income Div. (NIID)	H5*S5	?	13.0321	6.8897 *	0.8227	4.8991	13.7287	12.9423
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0047	0.0027 *	0.0013	0.0024	0.0085	0.0057
Activity interaction								
DGD * LD	H2*H3	?	-0.1065	0.1093	-0.0996	0.0944	1.1817	1.6364
DGD * NIID	H2*H5	?	0.0277	0.0625	0.0170	0.0521	1.2153	0.4752 **
SD * OBSD	H4*H6	?	-0.0596	0.1064	-0.0541	0.1148	0.1302	0.4655
All Activities	H2*H3*H4*H5*H6	?	0.1319	0.1446	0.0131	0.0982	0.4217	0.7829
Control variables								
International Loan Activity Dummy	ILAD		0.0039	0.0105	-0.0013	0.0090	-0.0192	0.0439
Log Asset	C1	?	-0.0202	0.0110 *	-0.0012	0.0086	-0.0049	0.0298
Equity Ratio	C2	?	-0.1491	0.2337	-0.1928	0.1917	-0.9083	0.5142 *
Asset Growth	C3	+	0.0155	0.0108	0.0124	0.0146	-0.0671	0.0451
Merger Dummy	C4	?	0.0022	0.0026	-0.0016	0.0022	0.0080	0.0063
Merger * Asset Growth	C4*C3	?	-0.0235	0.0144	-0.0088	0.0172	-0.0190	0.0584
Year 1999 Dummy	Y99		-0.0038	0.0053	0.0039	0.0051		
Year 2000 Dummy	Y00		-0.0117	0.0063 *	-0.0020	0.0051		
Year 2001 Dummy	Y01		-0.0236	0.0088 ***	-0.0128	0.0079		
Year 2002 Dummy	Y02		-0.0103	0.0092	-0.0019	0.0083		
Year 2003 Dummy	Y03		-0.0142	0.0107	-0.0027	0.0098		
Year 2004 Dummy	Y04		-0.0159	0.0109	-0.0046	0.0099		
Year 2005 Dummy	Y05		-0.0148	0.0114	-0.0027	0.0106		
Year 2006 Dummy	Y06		-0.0116	0.0111	0.0011	0.0092		
Year 2007 Dummy	Y07		-0.0250	0.0125 **				
Year 2008 Dummy	Y08		-0.0378	0.0115 ***			-0.0134	0.0046 ***
First-order Coefficient of Autocorrelation	AR(1)		0.2818	0.0888 ***	0.0760	0.0743	-0.0776	0.1785
Observations			368		296		71	
Adjusted R-squared			0.3998		0.2068		0.7313	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 40: Risk Adjusted Return on Equity (RAROE) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROE	Std. Error	RAROE	Std. Error	RAROE	Std. Error
Activity diversification								
	C		95.3758	33.8037 ***	-1.1592	53.4169	-155.6100	200.3431
Domestic Geographic Div. (DGD)	H2	?	-7.8519	27.3619	73.3471	30.9507 **	391.0233	422.5203
Loan Div. (LD)	H3	?	18.1356	14.5238	21.8210	17.8140	-79.6327	70.3949
Security Div. (SD)	H4	?	6.6566	23.9567	14.9084	23.9302	-101.0285	109.9443
Non-interest-income Div. (NIID)	H5	?	3.3933	6.0494	0.3387	9.2094	-20.2250	43.5292
Off-balance-sheet Div. (OBSD)	H6	?	12.2180	17.7978	20.6355	20.1781	185.4393	138.1701
Scale variables								
Deposit Ratio	S2	+	-1.7703	8.2319	4.8459	12.2901	20.4787	42.0697
Loan Ratio	S3	+	28.1825	30.1804	-14.4040	31.4116	-96.8069	103.7810
Security Ratio	S4	+	-22.0552	25.3956	-95.4521	37.0066 **	-299.7360	151.4618 *
Non-interest-income Ratio	S5	?	-76.1496	510.8467	462.7386	864.4708	-3455.3760	2467.2360
Off-balance-sheet Ratio	S6	?	-0.2122	0.2676	-0.9897	0.4242 **	1.3916	1.1378
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	23.1115	13.6660 *	-9.8904	17.9109	333.0149	207.4410
Loan Div. (LD)	H3*S3	?	-28.0148	41.8867	19.2555	43.1532	180.7225	146.9739
Security Div. (SD)	H4*S4	?	2.0036	42.0398	105.0286	52.4810 **	463.6028	203.6408 **
Non-interest-income Div. (NIID)	H5*S5	?	281.0057	838.8792	-517.2755	1358.5600	5782.3430	3448.8240
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.2357	0.4474	0.7032	0.6172	-0.6109	1.9456
Activity interaction								
DGD * LD	H2*H3	?	1.0062	38.3890	-127.3256	43.9893 ***	-736.3820	779.6397
DGD * NIID	H2*H5	?	-12.1270	12.0825	-5.7773	14.4825	-290.0451	178.2823
SD * OBSD	H4*H6	?	-7.9815	35.8112	-37.8250	35.4689	28.9556	166.2771
All Activities	H2*H3*H4*H5*H6	?	45.8348	32.4705	50.2091	34.0833	732.8598	464.9916
Control variables								
International Loan Activity Dummy	ILAD	+	11.9200	5.3335 **	6.2813	5.6084	-4.7820	27.4763
Log Asset	C1	?	-13.2047	4.1661 ***	-0.2042	6.4885	16.8215	22.1608
Equity Ratio	C2	?	-53.3545	41.1047	-79.9451	58.4289	-193.8715	140.7233
Asset Growth	C3	+	2.7602	1.9373	-5.5735	4.1103	2.0010	21.7782
Merger Dummy	C4	?	-0.0662	0.4243	-0.4664	0.5082	0.2898	2.5868
Merger * Asset Growth	C4*C3	?	-1.2594	2.4076	4.6854	4.9454	-15.7646	20.5153
Year 1999 Dummy	Y99		0.1202	0.8978	0.6896	1.2705		
Year 2000 Dummy	Y00		-1.3104	1.1702	0.1897	1.5815		
Year 2001 Dummy	Y01		-3.8677	1.9507 **	-0.3299	2.4861		
Year 2002 Dummy	Y02		-4.1041	2.1052 *	0.1818	2.5468		
Year 2003 Dummy	Y03		-4.4061	2.3258 *	1.1439	2.7811		
Year 2004 Dummy	Y04		-3.7836	2.5386	3.3488	3.0159		
Year 2005 Dummy	Y05		1.2445	4.6408	9.4166	4.8780 *		
Year 2006 Dummy	Y06		0.1882	4.0878	9.4003	4.2719 **		
Year 2007 Dummy	Y07		1.3678	3.8347				
Year 2008 Dummy	Y08		1.3194	3.5797			-7.0568	2.9487 **
First-order Coefficient of Autocorrelation	AR(1)		0.9052	0.0716 ***	0.8978	0.0293 ***	0.8909	0.0593 ***
Observations			368		296		71	
Adjusted R-squared			0.7881		0.8072		0.4871	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 41: Stock Return (SR) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			SR	Std. Error	SR	Std. Error	SR	Std. Error
Activity diversification								
	C		0.4135	0.5706	-0.0530	0.5899	4.3265	2.7563
Domestic Geographic Div. (DGD)	H2	?	0.8567	0.4280 **	1.0403	0.4361 **	13.0542	8.1934
Loan Div. (LD)	H3	?	-0.1704	0.1202	-0.0854	0.1245	-3.1628	1.4365 **
Security Div. (SD)	H4	?	-0.2208	0.2783	-0.1952	0.3138	5.6179	2.5926 **
Non-interest-income Div. (NIID)	H5	?	0.4247	0.2142 **	0.4824	0.2265 **	2.1498	1.0978 *
Off-balance-sheet Div. (OBSD)	H6	?	0.3423	0.1897 *	0.0609	0.2316	3.3744	1.4783 **
Scale variables								
Deposit Ratio	S2	+	-0.2835	0.1881	-0.0403	0.2130	1.5138	0.9668
Loan Ratio	S3	+	0.0515	0.2903	0.1369	0.2781	-1.9620	1.3656
Security Ratio	S4	+	-0.1433	0.4391	0.3136	0.4840	-3.0968	1.7885 *
Non-interest-income Ratio	S5	+	19.6689	20.0900	44.2724	20.0952 **	113.0497	70.5727
Off-balance-sheet Ratio	S6	?	0.0115	0.0078	0.0023	0.0083	-0.0555	0.0290 *
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.2102	0.2416	-0.4766	0.2870 *	-3.7295	3.0290
Loan Div. (LD)	H3*S3	?	0.0963	0.3467	-0.1618	0.3340	5.8509	2.8019 **
Security Div. (SD)	H4*S4	?	0.3985	0.6548	-0.4677	0.7081	3.9675	2.3797
Non-interest-income Div. (NIID)	H5*S5	?	-42.8288	27.7754	-68.4760	28.3754 **	-165.9905	100.7655
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0166	0.0132	-0.0002	0.0136	0.1186	0.0516 **
Activity interaction								
DGD * LD	H2*H3	?	-0.7449	0.5288	-0.5367	0.5123	-20.9437	13.6727
DGD * NIID	H2*H5	?	-0.6034	0.2869 **	-0.7594	0.3052 **	0.3726	4.1243
SD * OBSD	H4*H6	?	-0.1570	0.3743	0.2208	0.4504	-10.8434	3.9134 ***
All Activities	H2*H3*H4*H5*H6	?	0.3185	0.8272	-0.0807	0.7838	11.5173	7.5760
Control variables								
International Loan Activity Dummy	ILAD		-0.0371	0.0635	-0.0098	0.0722	0.3304	0.3161
Log Asset	C1	?	-0.0392	0.0617	-0.0107	0.0670	-0.6346	0.3093 **
Equity Ratio	C2	?	-0.3907	0.8700	1.0242	0.8413	-20.6284	4.4395 ***
Asset Growth	C3	+	0.0297	0.0972	-0.0344	0.1079	-0.2261	0.3889
Merger Dummy	C4	?	0.0678	0.0328 **	0.0497	0.0271 *	0.1782	0.1339
Merger * Asset Growth	C4*C3	?	-0.0971	0.1279	-0.0451	0.1352	-0.3373	0.5848
Year 1999 Dummy	Y99		-0.1421	0.0590 **	-0.2222	0.0510 ***		
Year 2000 Dummy	Y00		-0.0962	0.0589	-0.1637	0.0521 ***		
Year 2001 Dummy	Y01		-0.1744	0.0677 **	-0.2394	0.0627 ***		
Year 2002 Dummy	Y02		-0.2101	0.0684 ***	-0.2813	0.0634 ***		
Year 2003 Dummy	Y03		-0.1051	0.0728	-0.1745	0.0720 **		
Year 2004 Dummy	Y04		-0.1872	0.0745 **	-0.2598	0.0736 ***		
Year 2005 Dummy	Y05		-0.1996	0.0767 ***	-0.2731	0.0774 ***		
Year 2006 Dummy	Y06		-0.1491	0.0769 *	-0.2285	0.0776 ***		
Year 2007 Dummy	Y07		-0.2346	0.0797 ***				
Year 2008 Dummy	Y08		-0.2468	0.0934 ***			-0.0294	0.0371
First-order Coefficient of Autocorrelation	AR(1)		-0.3926	0.0749 ***	-0.2400	0.0679 ***	-0.6814	0.1177 ***
Observations			368		296		71	
Adjusted R-squared			0.2159		0.1348		0.4975	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 42: Risk Adjusted Stock Return (RASR) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RASR	Std. Error	RASR	Std. Error	RASR	Std. Error
Activity diversification								
	C		0.4837	4.0659	-0.5994	3.6782	15.8041	20.0183
Domestic Geographic Div. (DGD)	H2	?	6.2490	3.0604 **	5.5274	2.7619 **	146.5109	65.4651 **
Loan Div. (LD)	H3	?	-0.8841	0.8142	-0.4073	0.7657	-13.5514	11.5694
Security Div. (SD)	H4	?	-1.0938	1.9237	-0.5654	2.0482	31.7158	21.2873
Non-interest-income Div. (NIID)	H5	?	2.1143	1.5974	2.6929	1.4451 *	12.2434	8.9153
Off-balance-sheet Div. (OBSD)	H6	?	2.4766	1.3083 *	1.0753	1.5198	22.2708	12.6758 *
Scale variables								
Deposit Ratio	S2	+	-0.9608	1.3316	-0.3517	1.3187	12.2711	8.6428
Loan Ratio	S3	+	-0.8253	1.7994	0.8217	1.7649	-11.3509	10.7169
Security Ratio	S4	+	-1.2643	2.9951	1.8455	2.9978	-21.7416	13.4576
Non-interest-income Ratio	S5	?	114.1771	151.4683	245.0754	121.3881 **	771.6585	622.2104
Off-balance-sheet Ratio	S6	?	0.0703	0.0493	0.0190	0.0544	-0.3728	0.2176 *
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-1.2359	1.7698	-2.1258	1.7766	-36.8169	23.9100
Loan Div. (LD)	H3*S3	?	1.3453	2.2654	-0.7507	2.3128	28.9226	22.6241
Security Div. (SD)	H4*S4	?	3.5539	4.5943	-3.2993	4.5026	34.1975	18.7365 *
Non-interest-income Div. (NIID)	H5*S5	?	-274.9377	214.8600	-402.3415	177.1837 **	-1216.1930	894.1685
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.1049	0.0835	-0.0199	0.0894	0.8292	0.3834 **
Activity interaction								
DGD * LD	H2*H3	?	-7.0782	3.6071 *	-2.9107	3.3661	-233.3023	113.6958 **
DGD * NIID	H2*H5	?	-3.4317	2.0895	-4.1821	2.0666 **	3.1287	33.1027
SD * OBSD	H4*H6	?	-1.4494	2.5867	0.4728	2.9394	-66.0235	30.7011 **
All Activities	H2*H3*H4*H5*H6	?	3.8393	5.9664	-1.7674	5.8407	75.9651	58.6009
Control variables								
International Loan Activity Dummy	ILAD	+	-0.3071	0.4466	0.0763	0.4378	1.0310	2.8702
Log Asset	C1	?	0.0366	0.4309	-0.0431	0.4220	-2.9522	2.2836
Equity Ratio	C2	?	-0.1045	6.0627	5.9970	5.6793	-119.2002	31.0218 ***
Asset Growth	C3	+	0.0437	0.7052	-0.3031	0.7018	-1.7180	3.2818
Merger Dummy	C4	?	0.4507	0.2373 *	0.4244	0.2063 **	0.4579	0.9992
Merger * Asset Growth	C4*C3	?	-0.4008	0.8847	-0.1973	0.8688	-0.0286	4.7217
Year 1999 Dummy	Y99		-1.2381	0.4294 ***	-1.6323	0.3732 ***		
Year 2000 Dummy	Y00		-0.9054	0.4167 **	-1.2328	0.3678 ***		
Year 2001 Dummy	Y01		-1.3344	0.4786 ***	-1.6183	0.4229 ***		
Year 2002 Dummy	Y02		-1.6232	0.4895 ***	-1.8817	0.4335 ***		
Year 2003 Dummy	Y03		-0.8800	0.5309 *	-1.0825	0.4884 **		
Year 2004 Dummy	Y04		-1.3711	0.5457 **	-1.6072	0.4969 ***		
Year 2005 Dummy	Y05		-1.4959	0.5664 ***	-1.7178	0.5221 ***		
Year 2006 Dummy	Y06		-0.8579	0.5689	-1.0734	0.5310 **		
Year 2007 Dummy	Y07		-1.9635	0.5883 ***				
Year 2008 Dummy	Y08		-2.0741	0.6571 ***			-0.2354	0.3125
First-order Coefficient of Autocorrelation	AR(1)		-0.3753	0.0604 ***	-0.3154	0.0599 ***	-0.5802	0.1190 ***
Observations			368		296		71	
Adjusted R-squared			0.2458		0.1945		0.3027	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 43: Net Charge Off (NCO) Regressions for Money Center BHCs**

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	NCO	Std. Error	NCO	Std. Error	NCO	Std. Error
Activity diversification								
	C		-0.0082	0.0029 ***	-0.0071	0.0041 *	-0.0264	0.0077 ***
Domestic Geographic Div. (DGD)	H2	?	0.0039	0.0047	0.0050	0.0045	-0.0241	0.0134 *
Loan Div. (LD)	H3	?	-0.0016	0.0007 **	-0.0017	0.0008 **	-0.0003	0.0030
Security Div. (SD)	H4	?	0.0010	0.0014	0.0004	0.0016	0.0045	0.0052
Non-interest-income Div. (NIID)	H5	?	0.0028	0.0013 **	0.0026	0.0013 **	-0.0004	0.0020
Off-balance-sheet Div. (OBSD)	H6	?	0.0003	0.0012	0.0013	0.0018	-0.0033	0.0046
Scale variables								
Deposit Ratio	S2	-	-0.0007	0.0015	-0.0003	0.0014	0.0022	0.0017
Loan Ratio	S3	?	0.0006	0.0014	-0.0014	0.0015	-0.0022	0.0046
Security Ratio	S4	?	-0.0002	0.0019	-0.0038	0.0023 *	0.0091	0.0055
Non-interest-income Ratio	S5	?	0.2006	0.1077 *	0.1066	0.1286	0.0987	0.0939
Off-balance-sheet Ratio	S6	?	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0031	0.0026	-0.0036	0.0027	0.0082	0.0060
Loan Div. (LD)	H3*S3	?	0.0021	0.0016	0.0030	0.0016 *	0.0015	0.0064
Security Div. (SD)	H4*S4	?	0.0006	0.0030	0.0077	0.0037 **	-0.0095	0.0089
Non-interest-income Div. (NIID)	H5*S5	?	-0.1430	0.1511	-0.0486	0.1927	-0.1074	0.1201
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0000	0.0001	-0.0001	0.0001	0.0001	0.0001
Activity interaction								
DGD * LD	H2*H3	?	-0.0003	0.0041	-0.0027	0.0042	0.0247	0.0220
DGD * NIID	H2*H5	?	-0.0034	0.0023	-0.0024	0.0020	0.0084	0.0065
SD * OBSD	H4*H6	?	-0.0032	0.0019	-0.0045	0.0026 *	-0.0053	0.0086
All Activities	H2*H3*H4*H5*H6	?	0.0017	0.0057	0.0013	0.0061	-0.0146	0.0151
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0005	0.0003	-0.0006	0.0003 *	-0.0024	0.0009 **
Log Asset	C1	?	0.0010	0.0003 ***	0.0010	0.0004 **	0.0032	0.0009 ***
Equity Ratio	C2	?	0.0037	0.0104	0.0054	0.0094	0.0094	0.0062
Asset Growth	C3	+	-0.0002	0.0004	-0.0003	0.0004	-0.0011	0.0008
Merger Dummy	C4	?	-0.0001	0.0001	-0.0002	0.0001 *	0.0002	0.0001
Merger * Asset Growth	C4*C3	?	0.0008	0.0008	0.0014	0.0011	-0.0006	0.0009
Year 1999 Dummy	Y99		-0.0006	0.0004 *	-0.0006	0.0003 *		
Year 2000 Dummy	Y00		-0.0008	0.0004 **	-0.0008	0.0004 **		
Year 2001 Dummy	Y01		-0.0007	0.0005	-0.0008	0.0004 *		
Year 2002 Dummy	Y02		-0.0010	0.0005 **	-0.0011	0.0005 **		
Year 2003 Dummy	Y03		-0.0013	0.0005 **	-0.0015	0.0005 ***		
Year 2004 Dummy	Y04		-0.0017	0.0006 ***	-0.0019	0.0006 ***		
Year 2005 Dummy	Y05		-0.0018	0.0006 ***	-0.0020	0.0006 ***		
Year 2006 Dummy	Y06		-0.0019	0.0005 ***	-0.0021	0.0005 ***		
Year 2007 Dummy	Y07		-0.0019	0.0006 ***				
Year 2008 Dummy	Y08		-0.0011	0.0006 *			0.0004	0.0001 ***
First-order Coefficient of Autocorrelation	AR(1)		0.0898	0.1031	-0.0090	0.0645	1.0458	0.0453 ***
Observations			368		296		71	
Adjusted R-squared			0.4359		0.3820		0.8599	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

#### Appendix 44: Maturity Gap (MG) Regressions for Money Center BHCs

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	MG	Std. Error	MG	Std. Error	MG	Std. Error
Activity diversification								
	C		0.4693	0.3289	0.6419	0.3854 *	-0.2369	0.7443
Domestic Geographic Div. (DGD)	H2	?	-0.4228	0.2923	-0.2268	0.3034	-2.5801	1.0963 **
Loan Div. (LD)	H3	?	0.1688	0.1395	0.3044	0.1577 *	0.4279	0.4234
Security Div. (SD)	H4	?	-0.6013	0.2030 ***	-0.6971	0.2458 ***	0.2576	0.4542
Non-interest-income Div. (NIID)	H5	?	-0.0627	0.1273	-0.0160	0.1911	0.0242	0.1935
Off-balance-sheet Div. (OBSD)	H6	?	-0.2735	0.1142 **	-0.3379	0.1283 ***	0.0748	0.2859
Scale variables								
Deposit Ratio	S2	-	0.3527	0.1222 ***	0.4377	0.1264 ***	-0.0918	0.2273
Loan Ratio	S3	?	-0.7191	0.1895 ***	-0.8324	0.2573 ***	-0.1045	0.5265
Security Ratio	S4	?	-0.6082	0.2910 **	-0.9582	0.3630 ***	0.6692	0.4258
Non-interest-income Ratio	S5	?	-12.9188	11.8205	-6.2183	20.1693	-3.1867	8.7192
Off-balance-sheet Ratio	S6	?	0.0066	0.0036 *	0.0017	0.0049	0.0061	0.0043
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.3992	0.1706 **	0.3610	0.1913 *	1.8465	0.7579 **
Loan Div. (LD)	H3*S3	?	0.6492	0.2617 **	0.6193	0.3220 *	0.1254	0.7704
Security Div. (SD)	H4*S4	?	0.5191	0.5242	0.8767	0.6868	-1.6011	0.6237 **
Non-interest-income Div. (NIID)	H5*S5	?	15.6622	16.5817	2.4816	27.6636	7.6249	12.1108
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0202	0.0060 ***	-0.0131	0.0080	-0.0198	0.0078 **
Activity interaction								
DGD * LD	H2*H3	?	0.4216	0.3208	0.2533	0.3449	1.9426	1.6863
DGD * NIID	H2*H5	?	0.0579	0.1780	-0.1011	0.2151	0.7816	0.6178
SD * OBSD	H4*H6	?	0.7665	0.2640 ***	0.8667	0.2980 ***	0.0461	0.6974
All Activities	H2*H3*H4*H5*H6	?	-0.4191	0.4061	-0.0801	0.4122	-1.5809	1.2804
Control variables								
International Loan Activity Dummy	ILAD	+	0.0605	0.0420	0.0471	0.0509	0.1709	0.0721 **
Log Asset	C1	?	0.0111	0.0362	-0.0063	0.0434	0.0036	0.0697
Equity Ratio	C2	?	-1.0332	0.4749 **	-1.2534	0.6605 *	-0.1334	0.8010
Asset Growth	C3	+	0.0733	0.0338 **	0.0574	0.0464	0.1281	0.0920
Merger Dummy	C4	?	-0.0036	0.0065	-0.0044	0.0087	0.0007	0.0125
Merger * Asset Growth	C4*C3	?	-0.0206	0.0364	0.0041	0.0498	-0.0569	0.1046
Year 1999 Dummy	Y99		-0.0101	0.0156	-0.0181	0.0186		
Year 2000 Dummy	Y00		-0.0161	0.0207	-0.0225	0.0249		
Year 2001 Dummy	Y01		0.0178	0.0274	0.0268	0.0334		
Year 2002 Dummy	Y02		0.0403	0.0297	0.0502	0.0361		
Year 2003 Dummy	Y03		0.0274	0.0328	0.0480	0.0365		
Year 2004 Dummy	Y04		0.0382	0.0296	0.0672	0.0371 *		
Year 2005 Dummy	Y05		0.0318	0.0326	0.0668	0.0408		
Year 2006 Dummy	Y06		0.0084	0.0312	0.0347	0.0386		
Year 2007 Dummy	Y07		-0.0015	0.0322				
Year 2008 Dummy	Y08		0.0112	0.0327			0.0302	0.0105 ***
First-order Coefficient of Autocorrelation	AR(1)		0.6285	0.0873 ***	0.5689	0.1027 ***	0.5058	0.1749 ***
Observations			368		296		71	
Adjusted R-squared			0.7821		0.7450		0.8899	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 45: Derivatives Loss (DL) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			DL	Std. Error	DL	Std. Error	DL	Std. Error
Activity diversification								
	C		-0.0003	0.0002 *	0.0000	0.0002	-0.0007	0.0006
Domestic Geographic Div. (DGD)	H2	?	0.0002	0.0002	0.0001	0.0002	0.0003	0.0030
Loan Div. (LD)	H3	?	0.0000	0.0000	0.0000	0.0000	0.0002	0.0004
Security Div. (SD)	H4	?	0.0000	0.0001	-0.0001	0.0001	0.0004	0.0011
Non-interest-income Div. (NIID)	H5	?	0.0000	0.0001	0.0000	0.0001	-0.0005	0.0003
Off-balance-sheet Div. (OBSD)	H6	?	0.0000	0.0001	0.0000	0.0001	0.0000	0.0006
Scale variables								
Deposit Ratio	S2	-	0.0001	0.0001 **	0.0000	0.0001	0.0000	0.0002
Loan Ratio	S3	?	-0.0001	0.0001	0.0000	0.0001	0.0003	0.0003
Security Ratio	S4	?	0.0002	0.0001	0.0000	0.0001	0.0013	0.0006 *
Non-interest-income Ratio	S5	?	0.0025	0.0051	0.0003	0.0058	-0.0019	0.0163
Off-balance-sheet Ratio	S6	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0001	0.0001	0.0000	0.0001	0.0009	0.0008
Loan Div. (LD)	H3*S3	?	-0.0001	0.0001	-0.0001	0.0001	-0.0009	0.0007
Security Div. (SD)	H4*S4	?	-0.0002	0.0002	0.0000	0.0002	-0.0025	0.0013 *
Non-interest-income Div. (NIID)	H5*S5	?	-0.0022	0.0077	-0.0051	0.0087	0.0175	0.0247
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Activity interaction								
DGD * LD	H2*H3	?	-0.0002	0.0002	-0.0001	0.0002	-0.0028	0.0043
DGD * NIID	H2*H5	?	-0.0001	0.0001	-0.0002	0.0001 *	0.0007	0.0013
SD * OBSD	H4*H6	?	0.0000	0.0001	0.0000	0.0002	0.0001	0.0014
All Activities	H2*H3*H4*H5*H6	?	0.0006	0.0003 *	0.0007	0.0003 **	0.0016	0.0026
Control variables								
International Loan Activity Dummy	ILAD	+	0.0000	0.0000	0.0000	0.0000	-0.0001	0.0001
Log Asset	C1	?	0.0000	0.0000 **	0.0000	0.0000	0.0001	0.0001
Equity Ratio	C2	?	-0.0001	0.0003	-0.0004	0.0003	0.0009	0.0011
Asset Growth	C3	+	0.0000	0.0000 **	0.0000	0.0000 *	-0.0001	0.0001
Merger Dummy	C4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger * Asset Growth	C4*C3	?	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002
Year 1999 Dummy	Y99		0.0000	0.0000	0.0000	0.0000		
Year 2000 Dummy	Y00		0.0000	0.0000	0.0000	0.0000		
Year 2001 Dummy	Y01		0.0000	0.0000	0.0000	0.0000		
Year 2002 Dummy	Y02		0.0000	0.0000	0.0000	0.0000		
Year 2003 Dummy	Y03		0.0000	0.0000	0.0000	0.0000		
Year 2004 Dummy	Y04		0.0000	0.0000	0.0000	0.0000		
Year 2005 Dummy	Y05		0.0000	0.0000	0.0000	0.0000		
Year 2006 Dummy	Y06		0.0000	0.0000	0.0000	0.0000		
Year 2007 Dummy	Y07		0.0000	0.0000				
Year 2008 Dummy	Y08		0.0000	0.0000			0.0000	0.0000
First-order Coefficient of Autocorrelation	AR(1)		0.1641	0.0603 ***	0.2635	0.0628 ***	-0.4473	0.2259 *
Observations			368		296		71	
Adjusted R-squared			0.0653		0.0822		0.1527	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 46: Market Beta (MB) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MB	Std. Error	MB	Std. Error	MB	Std. Error
Activity diversification								
	C		-1.5737	0.7708 **	0.9544	0.5109 *	0.1864	3.7041
Domestic Geographic Div. (DGD)	H2	?	-0.4019	0.5949	-0.0958	0.3985	13.1079	12.9218
Loan Div. (LD)	H3	?	-0.0364	0.1311	0.1311	0.1307	-0.9341	2.3800
Security Div. (SD)	H4	?	0.4255	0.3447	0.2060	0.2332	3.7892	3.4879
Non-interest-income Div. (NIID)	H5	?	0.1593	0.1878	0.1894	0.1193	-0.8514	1.6013
Off-balance-sheet Div. (OBSD)	H6	?	0.2763	0.2520	0.0603	0.1743	2.5034	2.3634
Scale variables								
Deposit Ratio	S2	-	0.0199	0.1765	-0.3961	0.1432 ***	0.7368	1.2891
Loan Ratio	S3	?	0.8107	0.6417	0.4148	0.3323	0.3093	2.4601
Security Ratio	S4	?	0.4199	0.5354	0.2388	0.3252	-0.6758	2.7325
Non-interest-income Ratio	S5	?	4.9098	15.2661	-3.4394	10.2796	-54.8265	110.8962
Off-balance-sheet Ratio	S6	?	-0.0046	0.0079	-0.0042	0.0071	0.0094	0.0340
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.1253	0.3679	-0.0105	0.2437	-5.4568	4.1221
Loan Div. (LD)	H3*S3	?	-0.6684	0.9174	-0.4575	0.4767	-0.1701	4.3920
Security Div. (SD)	H4*S4	?	-0.5767	0.8681	-0.2346	0.5284	1.5394	3.8170
Non-interest-income Div. (NIID)	H5*S5	?	-3.9693	24.0976	1.5516	15.1781	71.3576	142.6850
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0028	0.0127	0.0085	0.0116	0.0059	0.0631
Activity interaction								
DGD * LD	H2*H3	?	1.0536	0.8059	0.6987	0.4621	-16.1543	20.7832
DGD * NIID	H2*H5	?	-0.1177	0.3267	-0.3925	0.2016 *	-0.8954	4.2727
SD * OBSD	H4*H6	?	-0.4394	0.4347	-0.1169	0.3081	-5.9295	5.5033
All Activities	H2*H3*H4*H5*H6	?	-0.6639	0.8874	0.1155	0.5034	-0.7918	9.0872
Control variables								
International Loan Activity Dummy	ILAD	+	0.2760	0.1387 **	0.0991	0.0792	-0.0049	0.4577
Log Asset	C1	?	0.2663	0.0834 ***	-0.0109	0.0605	0.0179	0.3696
Equity Ratio	C2	?	-2.4611	1.0711 **	0.5809	0.5459	-3.9320	4.8280
Asset Growth	C3	+	-0.0160	0.0235	0.0185	0.0215	-0.0940	0.5959
Merger Dummy	C4	?	0.0193	0.0183	0.0077	0.0094	0.0627	0.0962
Merger * Asset Growth	C4*C3	?	-0.0376	0.0505	-0.0017	0.0362	0.2402	0.6669
Year 1999 Dummy	Y99		0.0119	0.0138	-0.0143	0.0122		
Year 2000 Dummy	Y00		0.0174	0.0246	-0.0256	0.0199		
Year 2001 Dummy	Y01		-0.0132	0.0462	-0.0867	0.0310 ***		
Year 2002 Dummy	Y02		-0.0014	0.0495	-0.1001	0.0324 ***		
Year 2003 Dummy	Y03		-0.0239	0.0556	-0.1453	0.0358 ***		
Year 2004 Dummy	Y04		-0.0346	0.0593	-0.1752	0.0394 ***		
Year 2005 Dummy	Y05		-0.0469	0.0623	-0.2080	0.0417 ***		
Year 2006 Dummy	Y06		-0.0291	0.0690	-0.2491	0.0460 ***		
Year 2007 Dummy	Y07		-0.0100	0.0742				
Year 2008 Dummy	Y08		0.1271	0.0774			0.3547	0.0612 ***
First-order Coefficient of Autocorrelation	AR(1)		0.9462	0.0183 ***	0.9654	0.0191 ***	0.1792	0.2194
Observations			368		296		71	
Adjusted R-squared			0.8983		0.9647		0.5849	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



**Appendix 47: Interest Rate Beta (IRB) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			IRB	Std. Error	IRB	Std. Error	IRB	Std. Error
Activity diversification								
	C		0.6306	0.6645	0.4949	0.6504	5.4123	1.4421 ***
Domestic Geographic Div. (DGD)	H2	?	-0.6100	0.3985	-0.4553	0.4280	-0.7599	5.0563
Loan Div. (LD)	H3	?	0.1072	0.1461	-0.1030	0.1575	-0.7620	0.8082
Security Div. (SD)	H4	?	-0.3300	0.3131	-0.3022	0.2911	-6.0019	1.5783 ***
Non-interest-income Div. (NIID)	H5	?	-0.3695	0.1626 **	-0.3629	0.1590 **	-0.4232	0.6536
Off-balance-sheet Div. (OBSD)	H6	?	-0.2646	0.1869	-0.0579	0.1938	-3.7632	0.8644 ***
Scale variables								
Deposit Ratio	S2	-	-0.1651	0.1543	-0.0553	0.1575	-0.6750	0.5235
Loan Ratio	S3	?	0.2918	0.3887	-0.0659	0.3445	-1.4815	0.7165 **
Security Ratio	S4	?	0.1900	0.4368	-0.4224	0.4757	1.3331	1.0389
Non-interest-income Ratio	S5	?	-14.6477	15.7233	-30.9448	14.2532 **	-125.9803	43.6867 ***
Off-balance-sheet Ratio	S6	?	0.0020	0.0060	0.0070	0.0061	-0.0083	0.0168
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.4176	0.2528 *	0.1822	0.2712	3.4411	1.8378 *
Loan Div. (LD)	H3*S3	?	-0.2709	0.5441	0.2943	0.5138	2.5802	1.5879
Security Div. (SD)	H4*S4	?	-0.3617	0.7004	0.5712	0.7413	-2.3056	1.4125
Non-interest-income Div. (NIID)	H5*S5	?	21.8684	22.5413	41.1594	21.3482 *	159.2641	63.2331 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0003	0.0109	-0.0100	0.0103	0.0048	0.0288
Activity interaction								
DGD * LD	H2*H3	?	0.2066	0.5060	0.1888	0.5588	6.0082	8.1556
DGD * NIID	H2*H5	?	0.4288	0.2769	0.3988	0.3035	-4.6397	2.2403 **
SD * OBSD	H4*H6	?	0.5809	0.3897	0.1381	0.3654	10.0336	2.3846 ***
All Activities	H2*H3*H4*H5*H6	?	-0.0543	0.8250	0.2162	0.8912	-7.0632	4.5175
Control variables								
International Loan Activity Dummy	ILAD	+	0.0400	0.0817	-0.0295	0.0770	0.5900	0.1922 ***
Log Asset	C1	?	-0.0573	0.0745	-0.0025	0.0716	-0.3240	0.1727 *
Equity Ratio	C2	?	2.0341	0.9028 **	-0.8856	0.9729	6.1787	2.2611 ***
Asset Growth	C3	+	0.0379	0.0261	0.0421	0.0316	-0.2569	0.2204
Merger Dummy	C4	?	-0.0056	0.0171	0.0080	0.0149	0.0105	0.0687
Merger * Asset Growth	C4*C3	?	-0.0075	0.0401	-0.0269	0.0480	0.3073	0.3472
Year 1999 Dummy	Y99		-0.0162	0.0198	0.0086	0.0172		
Year 2000 Dummy	Y00		-0.0079	0.0263	0.0363	0.0275		
Year 2001 Dummy	Y01		0.0024	0.0418	0.0583	0.0426		
Year 2002 Dummy	Y02		-0.0177	0.0459	0.0460	0.0456		
Year 2003 Dummy	Y03		0.0390	0.0538	0.0970	0.0508 *		
Year 2004 Dummy	Y04		0.0275	0.0550	0.0885	0.0510 *		
Year 2005 Dummy	Y05		0.0097	0.0570	0.0691	0.0524		
Year 2006 Dummy	Y06		-0.0089	0.0579	0.0641	0.0534		
Year 2007 Dummy	Y07		0.0067	0.0626				
Year 2008 Dummy	Y08		-0.1198	0.0661 *			-0.1207	0.0210 ***
First-order Coefficient of Autocorrelation	AR(1)		0.7375	0.0514 ***	0.8248	0.0452 ***	-0.4561	0.1453 ***
Observations			368		296		71	
Adjusted R-squared			0.6118		0.6720		0.7168	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 48: Value at Risk (VaR) Regressions for the Whole Sample BHCs**

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	VaR	Std. Error	VaR	Std. Error	VaR	Std. Error
Activity diversification								
	C		-0.0003	0.0002 *	0.0003	0.0002	1.1372	25576.7200
Domestic Geographic Div. (DGD)	H2	?	-0.0002	0.0002	-0.0001	0.0001	-0.0003	0.0009
Loan Div. (LD)	H3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003
Security Div. (SD)	H4	?	0.0002	0.0001 *	0.0001	0.0001	-0.0001	0.0004
Non-interest-income Div. (NIID)	H5	?	0.0000	0.0000	0.0000	0.0000	-0.0002	0.0001
Off-balance-sheet Div. (OBSD)	H6	?	-0.0001	0.0001	-0.0001	0.0001 **	-0.0001	0.0002
Scale variables								
Deposit Ratio	S2	-	0.0001	0.0000 **	0.0001	0.0000	0.0001	0.0001
Loan Ratio	S3	?	0.0001	0.0001	0.0001	0.0001	0.0000	0.0004
Security Ratio	S4	?	0.0001	0.0001	0.0002	0.0001	0.0004	0.0003
Non-interest-income Ratio	S5	?	0.0049	0.0028 *	-0.0063	0.0048	-0.0005	0.0081
Off-balance-sheet Ratio	S6	?	0.0000	0.0000	0.0000	0.0000 *	0.0000	0.0000
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0001	0.0001	0.0002	0.0001 *	-0.0004	0.0004
Loan Div. (LD)	H3*S3	?	-0.0002	0.0001	-0.0002	0.0001 *	-0.0001	0.0005
Security Div. (SD)	H4*S4	?	-0.0002	0.0002	-0.0004	0.0001 **	-0.0005	0.0004
Non-interest-income Div. (NIID)	H5*S5	?	-0.0058	0.0039	0.0091	0.0068	0.0005	0.0112
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0000	0.0000 ***	0.0000	0.0000 ***	0.0000	0.0000
Activity interaction								
DGD * LD	H2*H3	?	0.0003	0.0002	0.0001	0.0002	-0.0003	0.0014
DGD * NIID	H2*H5	?	0.0000	0.0001	-0.0001	0.0001	0.0009	0.0004 **
SD * OBSD	H4*H6	?	-0.0002	0.0002	-0.0001	0.0001	0.0003	0.0006
All Activities	H2*H3*H4*H5*H6	?	0.0002	0.0002	0.0003	0.0003	-0.0016	0.0009 *
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0001	0.0000 *	0.0000	0.0000	-0.0001	0.0001 *
Log Asset	C1	?	0.0000	0.0000 *	0.0000	0.0000	0.0001	0.0000
Equity Ratio	C2	?	0.0003	0.0002	0.0006	0.0003 **	0.0007	0.0005
Asset Growth	C3	+	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
Merger Dummy	C4	?	0.0000	0.0000 **	0.0000	0.0000	0.0000	0.0000
Merger * Asset Growth	C4*C3	?	-0.0001	0.0000 ***	0.0000	0.0000	-0.0001	0.0001
Year 1999 Dummy	Y99		0.0000	0.0000	0.0000	0.0000		
Year 2000 Dummy	Y00		0.0000	0.0000	0.0000	0.0000		
Year 2001 Dummy	Y01		0.0000	0.0000 **	0.0000	0.0000		
Year 2002 Dummy	Y02		0.0000	0.0000 **	0.0000	0.0000		
Year 2003 Dummy	Y03		0.0000	0.0000 ***	0.0000	0.0000 *		
Year 2004 Dummy	Y04		0.0000	0.0000 ***	0.0000	0.0000 **		
Year 2005 Dummy	Y05		-0.0001	0.0000 ***	0.0000	0.0000 *		
Year 2006 Dummy	Y06		-0.0001	0.0000 ***	0.0000	0.0000 *		
Year 2007 Dummy	Y07		-0.0001	0.0000 **				
Year 2008 Dummy	Y08		0.0000	0.0000 **			0.0000	0.0000
First-order Coefficient of Autocorrelation	AR(1)		0.9548	0.0209 ***	0.9491	0.0235 ***	1.0000	0.0666 ***
Observations			295		240		54	
Adjusted R-squared			0.9254		0.9487		0.8252	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 49: Distance to Default (Z-Score) Regressions for Money Center BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			Z	Std. Error	Z	Std. Error	Z	Std. Error
Activity diversification								
	C		-267.08	772.80	-650.90	894.27	3167.03	3146.62
Domestic Geographic Div. (DGD)	H2	?	-1039.93	751.57	-722.12	695.80	2317.54	5531.60
Loan Div. (LD)	H3	?	202.45	184.96	24.70	231.03	-1311.52	1474.71
Security Div. (SD)	H4	?	158.35	488.10	249.74	503.46	-2933.73	1879.03
Non-interest-income Div. (NIID)	H5	?	132.69	222.24	-287.10	232.44	-434.86	829.09
Off-balance-sheet Div. (OBSD)	H6	?	152.35	362.77	-94.57	381.80	-2267.60	1894.87
Scale variables								
Deposit Ratio	S2	+	320.80	221.91	615.29	283.49 **	-699.61	865.29
Loan Ratio	S3	?	468.22	651.92	65.51	699.90	-1495.04	1739.00
Security Ratio	S4	?	33.99	366.17	-488.40	524.36	-2006.25	1917.63
Non-interest-income Ratio	S5	?	15121.70	11440.38	32147.47	17273.09 *	-13066.25	48494.85
Off-balance-sheet Ratio	S6	?	-3.58	4.93	-12.86	8.67	-25.60	24.51
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	821.82	368.71 **	1036.01	503.46 **	654.97	2596.24
Loan Div. (LD)	H3*S3	?	-1175.09	992.72	291.02	1022.69	1386.79	2456.32
Security Div. (SD)	H4*S4	?	-299.77	686.89	616.49	862.94	512.38	2948.46
Non-interest-income Div. (NIID)	H5*S5	?	-20768.17	19148.35	-35648.08	27972.50	8664.51	69239.03
Off-balance-sheet Div. (OBSD)	H6*S6	?	2.59	8.38	4.32	12.64	40.55	45.49
Activity interaction								
DGD * LD	H2*H3	?	1090.54	1061.15	-791.15	824.06	-7464.05	9208.86
DGD * NIID	H2*H5	?	-31.29	347.66	769.86	391.21 *	2622.75	3036.02
SD * OBSD	H4*H6	?	39.88	720.62	-256.19	757.61	4105.91	3080.67
All Activities	H2*H3*H4*H5*H6	?	228.91	761.42	169.31	909.05	-5828.76	9046.95
Control variables								
International Loan Activity Dummy	ILAD	-	37.62	128.45	297.32	160.08 *	-411.40	375.13
Log Asset	C1	?	3.75	101.95	52.13	116.71	107.11	275.63
Equity Ratio	C2	?	2006.28	1023.66 *	1147.45	1588.63	1677.31	2541.52
Asset Growth	C3	-	7.66	28.71	-21.88	34.35	-139.20	399.04
Merger Dummy	C4	?	0.76	11.12	2.83	13.37	25.95	63.61
Merger * Asset Growth	C4*C3	?	-24.87	59.30	-62.99	72.20	4.47	391.82
Year 1999 Dummy	Y99		-52.08	33.69	-18.39	29.14		
Year 2000 Dummy	Y00		-74.83	35.00 **	-17.65	31.68		
Year 2001 Dummy	Y01		-140.65	58.73 **	16.70	55.64		
Year 2002 Dummy	Y02		-163.60	59.65 ***	14.98	56.26		
Year 2003 Dummy	Y03		-176.37	62.19 ***	37.55	61.41		
Year 2004 Dummy	Y04		-169.69	63.31 ***	81.66	67.12		
Year 2005 Dummy	Y05		-140.33	66.19 **	142.64	73.06 *		
Year 2006 Dummy	Y06		-136.92	68.79 **	179.92	74.36 **		
Year 2007 Dummy	Y07		-200.55	72.29 ***				
Year 2008 Dummy	Y08		-219.05	74.25 ***			-134.27	60.52 **
First-order Coefficient of Autocorrelation	AR(1)		0.90	0.05 ***	0.93	0.02 ***	0.47	0.25 *
Observations			368		296		71	
Adjusted R-squared			0.7893		0.8106		0.3130	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 50: Return on Asset (ROA) Regressions for International BHCs**

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	ROA	Std. Error	ROA	Std. Error	ROA	Std. Error
Activity diversification								
	C		0.0210	0.0073 ***	0.0015	0.0085	0.0296	0.0369
International Geographic Div. (IGD)	H1	?	-0.0162	0.0068 **	-0.0033	0.0080	-0.0335	0.0196
Domestic Geographic Div. (DGD)	H2	?	-0.0067	0.0142	-0.0066	0.0100	-0.0920	0.0783
Loan Div. (LD)	H3	?	-0.0292	0.0078 ***	-0.0057	0.0115	-0.0450	0.0330
Security Div. (SD)	H4	?	-0.0037	0.0035	-0.0039	0.0038	-0.0369	0.0189 *
Non-interest-income Div. (NIID)	H5	?	0.0019	0.0048	-0.0060	0.0042	-0.0093	0.0164
Off-balance-sheet Div. (OBSD)	H6	?	0.0011	0.0024	0.0017	0.0019	-0.0200	0.0119
Scale variables								
Cross-border Loan Exposure Ratio	S1	+	0.0000	0.0000	0.0001	0.0000 *	0.0000	0.0004
Deposit Ratio	S2	+	0.0024	0.0019	0.0036	0.0019 *	0.0008	0.0125
Loan Ratio	S3	+	0.0092	0.0080	0.0114	0.0064 *	0.0456	0.0385
Security Ratio	S4	+	-0.0184	0.0046 ***	-0.0108	0.0029 ***	-0.0320	0.0224
Non-interest-income Ratio	S5	+	-0.6376	0.2555 **	-0.3890	0.2296 *	-0.8747	0.7461
Off-balance-sheet Ratio	S6	?	0.0000	0.0001	0.0000	0.0001	-0.0005	0.0003 *
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	0.0000	0.0001	0.0000	0.0001	0.0001	0.0010
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0105	0.0044 **	-0.0116	0.0040 ***	-0.0986	0.1327
Loan Div. (LD)	H3*S3	?	-0.0233	0.0132 *	-0.0203	0.0100 **	-0.0377	0.0659
Security Div. (SD)	H4*S4	?	0.0326	0.0076 ***	0.0196	0.0045 ***	0.0583	0.0373
Non-interest-income Div. (NIID)	H5*S5	?	0.9803	0.3914 **	0.9656	0.4290 **	1.1397	1.0958
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0000	0.0001	-0.0001	0.0002	0.0011	0.0005 **
Activity interaction								
IGD*LD	H1*H3	?	0.0365	0.0104 ***	0.0068	0.0146	0.0423	0.0531
IGD*NIID	H1*H5	?	-0.0048	0.0052	0.0013	0.0039	0.0133	0.0303
DGD * LD	H2*H3	?	0.0109	0.0199	0.0162	0.0141	0.0473	0.1524
DGD * NIID	H2*H5	?	0.0071	0.0074	0.0069	0.0062	0.1653	0.1010
SD * OBSD	H4*H6	?	-0.0062	0.0053	-0.0013	0.0054	0.0741	0.0306 **
All Activities	H1*H2*H3*H4*H5*H6	?	-0.0074	0.0230	-0.0221	0.0158	-0.5482	0.1779 ***
Control variables								
Log Asset	C1	?	0.0002	0.0005	0.0009	0.0003 ***	0.0018	0.0034
Equity Ratio	C2	?	0.0066	0.0112	-0.0049	0.0104	-0.1518	0.0514 ***
Asset Growth	C3	+	-0.0007	0.0008	-0.0002	0.0006	-0.0042	0.0045
Merger Dummy	C4	?	0.0003	0.0004	0.0000	0.0004	0.0722	0.0383 *
Merger * Asset Growth	C4*C3	?	0.0004	0.0010	0.0012	0.0011	-0.2791	0.1508 *
Year 1999 Dummy	Y99		0.0001	0.0003	0.0005	0.0004		
Year 2000 Dummy	Y00		-0.0003	0.0004	0.0001	0.0004		
Year 2001 Dummy	Y01		-0.0016	0.0007 **	-0.0008	0.0006		
Year 2002 Dummy	Y02		-0.0016	0.0007 **	-0.0004	0.0006		
Year 2003 Dummy	Y03		-0.0022	0.0008 ***	-0.0009	0.0008		
Year 2004 Dummy	Y04		-0.0026	0.0008 ***	-0.0013	0.0008		
Year 2005 Dummy	Y05		-0.0024	0.0009 ***	-0.0010	0.0008		
Year 2006 Dummy	Y06		-0.0019	0.0008 **	-0.0006	0.0007		
Year 2007 Dummy	Y07		-0.0031	0.0009 ***				
Year 2008 Dummy	Y08		-0.0040	0.0010 ***			0.0000	0.0007
First-order Coefficient of Autocorrelation	AR(1)		0.3455	0.1025 ***	0.1113	0.1029	-0.6592	0.1984 ***
Observations			245		197		47	
Adjusted R-squared			0.5512		0.5103		0.8423	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 51: Risk Adjusted Return on Asset (RAROA) Regressions for International BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROA	Std. Error	RAROA	Std. Error	RAROA	Std. Error
Activity diversification								
	C		119.3283	17.7816 ***	75.3186	25.3028 ***	37.1736	34.2768
International Geographic Div. (IGD)	H1	?	-78.2784	17.8270 ***	-100.6305	30.5298 ***	-9.4731	31.7766
Domestic Geographic Div. (DGD)	H2	?	31.5109	27.0126	48.0678	29.1967	-329.6981	130.9980 **
Loan Div. (LD)	H3	?	-55.1982	20.4345 ***	-74.4565	44.6517 *	73.1070	47.3587
Security Div. (SD)	H4	?	-1.9705	12.9009	5.8776	14.8714	-65.5245	26.7107 **
Non-interest-income Div. (NIID)	H5	?	-33.6704	11.2097 ***	-44.6512	14.6439 ***	-10.8848	14.4623
Off-balance-sheet Div. (OBSD)	H6	?	-2.1564	6.6365	-2.1850	7.1364	-36.3439	13.6108 **
Scale variables								
Cross-border Loan Exposure Ratio	S1	+	0.0876	0.2346	-0.0053	0.2225	0.2457	0.2789
Deposit Ratio	S2	+	4.2092	5.7324	15.1309	7.3031 **	-0.6421	11.8787
Loan Ratio	S3	+	-12.1124	13.6355	-17.9572	19.7011	122.4148	37.2789 ***
Security Ratio	S4	+	-32.8711	15.7402 **	-26.9761	15.2661 *	-70.5716	33.9105 *
Non-interest-income Ratio	S5	?	-1.4295	303.2079	235.2050	314.5678	-635.0402	869.8991
Off-balance-sheet Ratio	S6	?	-0.2522	0.1910	-0.3918	0.2529	-0.0815	0.2905
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	-0.1498	0.3650	0.0713	0.3457	-1.5457	0.6054 **
Domestic Geographic Div. (DGD)	H2*S2	?	6.8660	9.4356	0.4081	10.1195	314.4680	200.2617
Loan Div. (LD)	H3*S3	?	-6.8971	23.7175	-6.1347	33.5933	-171.7180	68.7554 **
Security Div. (SD)	H4*S4	?	36.1438	24.4910	26.7493	26.3460	158.9234	50.6275 ***
Non-interest-income Div. (NIID)	H5*S5	?	314.2651	471.6959	178.8989	557.1382	1257.4300	1386.7150
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.3377	0.3537	0.3051	0.4632	0.4506	0.5136
Activity interaction								
IGD*LD	H1*H3	?	81.6928	28.7511 ***	107.7094	57.7059 *	-171.0714	84.1364 *
IGD*NIID	H1*H5	?	52.4429	15.1058 ***	63.8254	17.7796 ***	148.6763	35.2530 ***
DGD * LD	H2*H3	?	-36.1433	37.8469	-58.0576	41.7545	834.4693	245.0767 ***
DGD * NIID	H2*H5	?	-29.5276	12.4740 **	-29.0974	12.7191 **	-440.8123	158.5297 **
SD * OBSD	H4*H6	?	-10.3230	16.9491	-17.4557	20.7133	101.9944	43.6947 **
All Activities	H1*H2*H3*H4*H5*H6	?	83.7005	41.6718 **	66.5073	41.1465	393.5016	256.7306
Control variables								
Log Asset	C1	?	-6.0389	1.9609 ***	0.7056	2.2410	-5.4890	4.1671
Equity Ratio	C2	?	38.2318	26.7190	71.7530	35.5822 **	-172.0002	84.9548 *
Asset Growth	C3	+	0.2452	0.6033	-0.7874	0.7757	8.4649	6.2981
Merger Dummy	C4	?	-0.0809	0.6848	-1.0738	0.9747	167.8971	64.4416 **
Merger * Asset Growth	C4*C3	?	-0.9807	1.8877	1.2749	1.9594	-665.3232	254.1395 **
Year 1999 Dummy	Y99		0.6574	1.0170	0.7118	1.2214		
Year 2000 Dummy	Y00		0.0810	1.1304	0.1314	1.2589		
Year 2001 Dummy	Y01		-3.6472	1.7296 **	-3.2710	1.9671 *		
Year 2002 Dummy	Y02		-3.5796	1.8048 **	-3.0301	2.0908		
Year 2003 Dummy	Y03		-3.7566	2.0944 *	-2.9082	2.3905		
Year 2004 Dummy	Y04		-3.6563	2.1246 *	-2.7283	2.3961		
Year 2005 Dummy	Y05		-3.4032	2.1630	-1.8817	2.4437		
Year 2006 Dummy	Y06		-2.9461	1.9253	-0.3358	2.0660		
Year 2007 Dummy	Y07		-3.7480	2.1424 *				
Year 2008 Dummy	Y08		-3.8958	2.1998 *			0.3991	0.8842
First-order Coefficient of Autocorrelation	AR(1)		0.9268	0.0356 ***	0.8594	0.0508 ***	-0.7407	0.2363 ***
Observations			245		197		47	
Adjusted R-squared			0.7845		0.7695		0.9148	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

## Appendix 52: Return on Equity (ROE) Regressions for International BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROE	Std. Error	ROE	Std. Error	ROE	Std. Error
Activity diversification								
	C		0.2517	0.1056 **	0.0233	0.1446	0.3155	0.4595
International Geographic Div. (IGD)	H1	?	-0.1248	0.0996	-0.0113	0.1309	-0.3210	0.2370
Domestic Geographic Div. (DGD)	H2	?	-0.1616	0.1987	-0.1286	0.1382	-1.6017	1.0182
Loan Div. (LD)	H3	?	-0.3174	0.1139 ***	-0.0641	0.1885	-0.3771	0.4146
Security Div. (SD)	H4	?	-0.0158	0.0511	-0.0158	0.0561	-0.4877	0.2384 *
Non-interest-income Div. (NIID)	H5	?	0.0355	0.0703	-0.0753	0.0628	-0.1342	0.2165
Off-balance-sheet Div. (OBSD)	H6	?	0.0277	0.0341	0.0311	0.0267	-0.2679	0.1522 *
Scale variables								
Cross-border Loan Exposure Ratio	S1	+	0.0002	0.0007	0.0007	0.0006	0.0008	0.0052
Deposit Ratio	S2	+	0.0283	0.0296	0.0513	0.0294 *	-0.0112	0.1599
Loan Ratio	S3	+	0.1610	0.1192	0.1732	0.0950 *	0.7457	0.4961
Security Ratio	S4	+	-0.2425	0.0719 ***	-0.1333	0.0440 ***	-0.4381	0.2803
Non-interest-income Ratio	S5	+	-11.7287	4.6621 **	-5.9734	3.7376	-15.1127	9.5861
Off-balance-sheet Ratio	S6	?	0.0000	0.0011	0.0001	0.0019	-0.0053	0.0035
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	0.0005	0.0011	0.0000	0.0010	0.0010	0.0139
Domestic Geographic Div. (DGD)	H2*S2	?	-0.1202	0.0652 *	-0.1594	0.0605 ***	-1.2207	1.6066
Loan Div. (LD)	H3*S3	?	-0.3904	0.1995 *	-0.3100	0.1428 **	-0.7184	0.8446
Security Div. (SD)	H4*S4	?	0.4503	0.1242 ***	0.2446	0.0684 ***	0.8626	0.4749 *
Non-interest-income Div. (NIID)	H5*S5	?	18.0231	6.7488 ***	14.7023	6.7711 **	22.1181	14.1156
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0004	0.0019	-0.0008	0.0029	0.0110	0.0061 *
Activity interaction								
IGD*LD	H1*H3	?	0.3814	0.1518 **	0.0724	0.2384	0.4000	0.6606
IGD*NIID	H1*H5	?	-0.1196	0.0787	-0.0161	0.0536	0.1263	0.3984
DGD * LD	H2*H3	?	0.1824	0.2738	0.2528	0.1997	0.9853	1.9821
DGD * NIID	H2*H5	?	0.1383	0.1051	0.1238	0.0939	2.3271	1.2335 *
SD * OBSD	H4*H6	?	-0.1430	0.0786 *	-0.0731	0.0804	0.9784	0.3827 **
All Activities	H1*H2*H3*H4*H5*H6	?	0.0176	0.3348	-0.2854	0.2346	-6.8405	2.2140 ***
Control variables								
Log Asset	C1	?	0.0044	0.0063	0.0132	0.0045 ***	0.0177	0.0413
Equity Ratio	C2	?	-0.2095	0.1861	-0.4659	0.1648 ***	-2.0194	0.6343 ***
Asset Growth	C3	+	-0.0019	0.0099	0.0037	0.0114	-0.0141	0.0568
Merger Dummy	C4	?	0.0037	0.0053	-0.0007	0.0058	0.8322	0.4703 *
Merger * Asset Growth	C4*C3	?	0.0005	0.0154	0.0165	0.0182	-3.2590	1.8507 *
Year 1999 Dummy	Y99		0.0024	0.0044	0.0080	0.0056		
Year 2000 Dummy	Y00		-0.0056	0.0063	0.0005	0.0058		
Year 2001 Dummy	Y01		-0.0280	0.0102 ***	-0.0130	0.0091		
Year 2002 Dummy	Y02		-0.0297	0.0113 ***	-0.0075	0.0092		
Year 2003 Dummy	Y03		-0.0400	0.0138 ***	-0.0149	0.0119		
Year 2004 Dummy	Y04		-0.0471	0.0141 ***	-0.0223	0.0125 *		
Year 2005 Dummy	Y05		-0.0441	0.0144 ***	-0.0171	0.0126		
Year 2006 Dummy	Y06		-0.0362	0.0129 ***	-0.0110	0.0110		
Year 2007 Dummy	Y07		-0.0538	0.0154 ***				
Year 2008 Dummy	Y08		-0.0640	0.0149 ***			0.0038	0.0094
First-order Coefficient of Autocorrelation	AR(1)		0.3623	0.1076 ***	0.1211	0.1133	-0.6232	0.2187 **
Observations			245		197		47	
Adjusted R-squared			0.5414		0.4519		0.8778	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

### Appendix 53: Risk Adjusted Return on Equity (RAROE) Regressions for International BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROE	Std. Error	RAROE	Std. Error	RAROE	Std. Error
Activity diversification								
	C		133.4877	26.2312 ***	159.7129	46.9507 ***	24.2227	37.6369
International Geographic Div. (IGD)	H1	?	-134.3897	34.8354 ***	-214.7809	67.0308 ***	-4.2220	35.6924
Domestic Geographic Div. (DGD)	H2	?	51.3010	33.6200	79.1227	38.3799 **	-451.5756	147.1622 ***
Loan Div. (LD)	H3	?	-71.8340	37.6892 *	-156.4724	84.6912 *	113.5199	52.3019 **
Security Div. (SD)	H4	?	10.0235	17.7552	21.2101	21.6300	-83.8278	31.0228 **
Non-interest-income Div. (NIID)	H5	?	-65.4190	26.4165 **	-88.1935	36.2300 **	-20.0719	15.9988
Off-balance-sheet Div. (OBSD)	H6	?	3.8203	8.9138	0.2679	10.9895	-42.6804	15.9869 **
Scale variables								
Cross-border Loan Exposure Ratio	S1	+	-0.0723	0.3121	-0.4554	0.2352 *	0.3211	0.2909
Deposit Ratio	S2	+	2.4877	6.8588	14.9117	7.4050 **	0.5646	13.0681
Loan Ratio	S3	+	1.7370	23.5837	-21.9392	29.6438	150.7680	41.3441 ***
Security Ratio	S4	+	-39.2505	18.8173 **	-22.9936	25.9705	-84.2989	38.6429 **
Non-interest-income Ratio	S5	?	417.6116	488.3546	1141.5160	523.7615 **	-970.1462	1021.3070
Off-balance-sheet Ratio	S6	?	-0.4149	0.2700	-0.6356	0.3667 *	0.1293	0.3414
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	0.0130	0.4953	0.5870	0.3724	-2.1174	0.6005 ***
Domestic Geographic Div. (DGD)	H2*S2	?	6.5113	10.5712	-11.5352	10.3874	427.9980	227.2780 *
Loan Div. (LD)	H3*S3	?	-30.2902	38.2794	1.5693	49.9609	-209.7732	76.6416 **
Security Div. (SD)	H4*S4	?	39.2769	32.4849	12.7593	49.4052	200.9623	59.0355 ***
Non-interest-income Div. (NIID)	H5*S5	?	-274.2126	806.9729	-1252.9180	992.6846	2133.6400	1645.6000
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.4530	0.4553	0.6155	0.6135	0.1151	0.6008
Activity interaction								
IGD*LD	H1*H3	?	115.9632	53.7685 **	225.9622	112.5761 **	-230.1052	91.4157 **
IGD*NIID	H1*H5	?	100.0126	34.8912 ***	128.2177	41.8492 ***	184.7261	37.9968 ***
DGD * LD	H2*H3	?	-63.2292	44.8141	-89.4125	51.0604 *	1081.3990	271.3418 ***
DGD * NIID	H2*H5	?	-43.1060	19.1393 **	-41.6736	20.1218 **	-553.2227	178.0379 ***
SD * OBSD	H4*H6	?	-35.9845	23.9255	-44.0375	27.5508	129.2267	51.2624 **
All Activities	H1*H2*H3*H4*H5*H6	?	140.5912	53.1689 ***	87.6894	50.2933 *	589.7629	293.8019 *
Control variables								
Log Asset	C1	?	-3.0415	2.3501	0.6610	2.1965	-5.4882	4.4950
Equity Ratio	C2	?	-4.1970	40.2560	-10.7034	40.1445	-228.8636	97.6488 **
Asset Growth	C3	+	0.1791	1.2371	-0.8386	1.1086	14.3931	7.2908 *
Merger Dummy	C4	?	0.8156	0.6352	0.2435	0.6174	197.4068	77.0659 **
Merger * Asset Growth	C4*C3	?	-4.6536	2.7556 *	-1.1249	2.7176	-786.8271	303.4011 **
Year 1999 Dummy	Y99		0.1557	1.6715	0.6882	1.7602		
Year 2000 Dummy	Y00		-0.0670	2.0303	0.5797	1.8428		
Year 2001 Dummy	Y01		-5.8662	2.5696 **	-3.6366	2.5141		
Year 2002 Dummy	Y02		-5.6532	2.8011 **	-3.2971	2.7224		
Year 2003 Dummy	Y03		-5.7484	3.3363 *	-2.8881	3.2747		
Year 2004 Dummy	Y04		-5.6649	3.6523	-3.0802	3.4380		
Year 2005 Dummy	Y05		-5.6363	3.8407	-2.7357	3.6559		
Year 2006 Dummy	Y06		-5.5548	3.2320 *	-1.4510	3.1268		
Year 2007 Dummy	Y07		-4.9066	3.5162				
Year 2008 Dummy	Y08		-5.7620	3.6671			0.7570	1.0136
First-order Coefficient of Autocorrelation	AR(1)		0.7609	0.1296 ***	0.7125	0.1628 ***	-0.7609	0.2261 ***
Observations			245		197		47	
Adjusted R-squared			0.7945		0.8151		0.8895	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

#### Appendix 54: Stock Return (SR) Regressions for International BHCs

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	SR	Std. Error	SR	Std. Error	SR	Std. Error
Activity diversification								
	C		-0.4545	0.7195	-2.2631	0.9725 **	11.1143	2.8023 ***
International Geographic Div. (IGD)	H1	?	0.0965	0.6447	1.2705	0.9091	6.2288	2.7726 **
Domestic Geographic Div. (DGD)	H2	?	1.0005	1.1192	1.3404	1.1489	2.7008	12.0316
Loan Div. (LD)	H3	?	0.2091	0.8722	2.3886	1.3328 *	8.1589	4.3268 *
Security Div. (SD)	H4	?	0.5776	0.3904	1.1470	0.4835 **	-0.0513	2.5449
Non-interest-income Div. (NIID)	H5	?	0.6004	0.4295	0.6810	0.5082	-1.4718	2.6351
Off-balance-sheet Div. (OBSD)	H6	?	0.8241	0.2603 ***	1.0575	0.2829 ***	-0.1561	1.5317
Scale variables								
Cross-border Loan Exposure Ratio	S1	+	0.0121	0.0054 **	0.0222	0.0053 ***	-0.0171	0.0439
Deposit Ratio	S2	+	0.3601	0.2334	0.3651	0.2643	-3.5758	1.0964 ***
Loan Ratio	S3	+	1.1067	0.6285 *	1.0116	0.6494	2.1909	4.3543
Security Ratio	S4	+	0.8859	0.4832 *	1.4010	0.5127 ***	-3.1787	3.3502
Non-interest-income Ratio	S5	+	23.5706	25.9189	64.8164	36.0502 *	-5.7962	76.9782
Off-balance-sheet Ratio	S6	?	-0.0027	0.0087	-0.0078	0.0134	-0.0361	0.0306
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	-0.0228	0.0092 **	-0.0359	0.0088 ***	-0.1099	0.1164
Domestic Geographic Div. (DGD)	H2*S2	?	-0.6524	0.4758	-0.7886	0.5106	14.9320	13.3595
Loan Div. (LD)	H3*S3	?	-2.6280	1.0058 ***	-2.3551	1.0438 **	-7.1852	7.7659
Security Div. (SD)	H4*S4	?	-1.0331	0.7046	-1.7564	0.7788 **	-2.9879	5.4594
Non-interest-income Div. (NIID)	H5*S5	?	-31.4298	42.1759	-94.0090	64.9007	-78.2420	122.6853
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0095	0.0142	0.0178	0.0216	0.0641	0.0590
Activity interaction								
IGD*LD	H1*H3	?	-0.3402	1.1745	-3.1786	1.7290 *	-14.6372	6.3671 **
IGD*NIID	H1*H5	?	0.3411	0.4730	0.8498	0.4554 *	4.1345	3.1547
DGD * LD	H2*H3	?	0.4002	1.6228	0.6350	1.6081	-8.0618	21.7745
DGD * NIID	H2*H5	?	-1.3718	0.6392 **	-1.8330	0.7453 **	-1.3451	11.6124
SD * OBSD	H4*H6	?	-0.8673	0.5491	-1.3643	0.6567 **	-1.3185	4.0055
All Activities	H1*H2*H3*H4*H5*H6	?	0.2012	2.1679	-1.0067	2.0642	0.3471	18.0582
Control variables								
Log Asset	C1	?	-0.0529	0.0324	-0.0201	0.0334	-1.2336	0.3684 ***
Equity Ratio	C2	?	1.3012	0.9279	3.4372	1.1903 ***	-6.6950	6.1954
Asset Growth	C3	+	-0.0214	0.1217	-0.0143	0.1326	0.4576	0.7766
Merger Dummy	C4	?	0.0773	0.0712	-0.0037	0.0485	-1.1637	4.0606
Merger * Asset Growth	C4*C3	?	-0.1386	0.2121	-0.0887	0.1915	5.6090	16.0306
Year 1999 Dummy	Y99		-0.2313	0.0955 **	-0.3592	0.0915 ***		
Year 2000 Dummy	Y00		-0.1874	0.0925 **	-0.3070	0.0870 ***		
Year 2001 Dummy	Y01		-0.3609	0.1026 ***	-0.5220	0.1061 ***		
Year 2002 Dummy	Y02		-0.4318	0.0997 ***	-0.5717	0.1059 ***		
Year 2003 Dummy	Y03		-0.3535	0.1156 ***	-0.4939	0.1272 ***		
Year 2004 Dummy	Y04		-0.4505	0.1168 ***	-0.6090	0.1284 ***		
Year 2005 Dummy	Y05		-0.4446	0.1195 ***	-0.6052	0.1295 ***		
Year 2006 Dummy	Y06		-0.3868	0.1109 ***	-0.5608	0.1210 ***		
Year 2007 Dummy	Y07		-0.4695	0.1160 ***				
Year 2008 Dummy	Y08		-0.5284	0.1311 ***			-0.0222	0.0997
First-order Coefficient of Autocorrelation	AR(1)		-0.4540	0.0870 ***	-0.3733	0.0726 ***	-0.7325	0.2495 **
Observations			245		197		47	
Adjusted R-squared			0.2790		0.2492		0.6836	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



# Appendix 55: Risk Adjusted Stock Return (RASR) Regressions for International BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RASR	Std. Error	RASR	Std. Error	RASR	Std. Error
Activity diversification								
	C		-3.1397	4.9304	-14.7510	6.1895 **	72.4340	31.8549 **
International Geographic Div. (IGD)	H1	?	1.4961	4.5812	8.1308	5.8661	64.4689	21.6881 ***
Domestic Geographic Div. (DGD)	H2	?	9.1357	6.4651	9.9712	6.1720	50.0620	108.8743
Loan Div. (LD)	H3	?	0.2695	6.5180	13.6030	8.6039	74.9838	37.6232 *
Security Div. (SD)	H4	?	1.4590	2.6827	5.3929	3.2033 *	0.9327	25.8531
Non-interest-income Div. (NIID)	H5	?	4.6606	3.1163	5.5852	2.9244 *	-8.8499	30.6604
Off-balance-sheet Div. (OBSD)	H6	?	3.0290	1.6827 *	4.7303	1.6378 ***	-2.3687	17.2487
Scale variables								
Cross-border Loan Exposure Ratio	S1	+	0.0788	0.0451 *	0.1373	0.0404 ***	0.0258	0.6854
Deposit Ratio	S2	+	2.4929	1.6433	1.7054	1.6660	-23.7526	13.2374 *
Loan Ratio	S3	+	5.9127	4.0048	4.8265	3.8019	-5.9224	47.6806
Security Ratio	S4	+	2.3501	3.1628	6.8627	3.1003 **	-8.7378	29.6657
Non-interest-income Ratio	S5	?	87.7082	194.0487	426.9273	216.5276 *	-180.6748	773.9004
Off-balance-sheet Ratio	S6	?	-0.0242	0.0585	-0.0578	0.0849	-0.0941	0.2315
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	-0.1460	0.0782 *	-0.2107	0.0728 ***	-1.3782	1.9582
Domestic Geographic Div. (DGD)	H2*S2	?	-1.6706	3.1688	-2.0721	3.3437	66.8035	115.2613
Loan Div. (LD)	H3*S3	?	-15.3783	6.4014 **	-12.1785	6.0170 **	-19.6326	85.1237
Security Div. (SD)	H4*S4	?	-1.1694	4.8364	-8.1406	4.8771 *	-38.9573	50.2273
Non-interest-income Div. (NIID)	H5*S5	?	-115.2279	309.5788	-704.1505	377.9077 *	-77.5614	1137.9410
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0650	0.0955	0.1203	0.1372	0.1190	0.4343
Activity interaction								
IGD*LD	H1*H3	?	-0.6685	8.5349	-18.3714	11.1236	-115.6986	51.7999 **
IGD*NIID	H1*H5	?	-0.4410	3.4871	3.4491	2.8502	14.9106	38.3838
DGD * LD	H2*H3	?	-4.1165	9.2497	-1.2054	8.3373	-104.0713	184.2015
DGD * NIID	H2*H5	?	-10.2076	3.8744 ***	-12.7469	4.3671 ***	-1.7488	89.2982
SD * OBSD	H4*H6	?	-3.3151	3.9410	-6.7245	4.5025	-12.8182	39.9025
All Activities	H1*H2*H3*H4*H5*H6	?	14.3611	13.7091	4.6273	11.6893	37.3833	144.0850
Control variables								
Log Asset	C1	?	-0.1056	0.2390	0.1352	0.2553	-9.9533	3.3309 ***
Equity Ratio	C2	?	8.9286	7.6132	24.2201	7.6998 ***	10.0704	51.1295
Asset Growth	C3	+	-0.4924	0.8505	0.0025	0.7098	5.0691	6.2055
Merger Dummy	C4	?	0.7528	0.5291	0.2386	0.4267	-50.3955	34.2320
Merger * Asset Growth	C4*C3	?	-0.6235	1.3309	-0.9362	1.1055	202.5134	135.9317
Year 1999 Dummy	Y99		-1.2375	0.4254 ***	-2.0906	0.4584 ***		
Year 2000 Dummy	Y00		-0.9804	0.4176 **	-1.7619	0.4347 ***		
Year 2001 Dummy	Y01		-1.9275	0.4668 ***	-2.8952	0.5212 ***		
Year 2002 Dummy	Y02		-2.4940	0.4649 ***	-3.3308	0.5345 ***		
Year 2003 Dummy	Y03		-1.9466	0.5600 ***	-2.7462	0.6363 ***		
Year 2004 Dummy	Y04		-2.4457	0.5742 ***	-3.3947	0.6531 ***		
Year 2005 Dummy	Y05		-2.4753	0.6023 ***	-3.4598	0.6719 ***		
Year 2006 Dummy	Y06		-1.8868	0.5561 ***	-2.9214	0.6383 ***		
Year 2007 Dummy	Y07		-2.8789	0.6175 ***				
Year 2008 Dummy	Y08		-3.1721	0.7126 ***			0.1243	0.8987
First-order Coefficient of Autocorrelation	AR(1)		-0.4123	0.0697 ***	-0.4028	0.0631 ***	-0.5137	0.3494
Observations			245		197		47	
Adjusted R-squared			0.2663		0.2429		0.4354	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 56: Net Charge Off (NCO) Regressions for International BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			NCO	Std. Error	NCO	Std. Error	NCO	Std. Error
Activity diversification								
	C		-0.0088	0.0027 ***	-0.0058	0.0032 *	-0.0282	0.0148 *
International Geographic Div. (IGD)	H1	?	0.0055	0.0021 **	0.0035	0.0035	0.0083	0.0053
Domestic Geographic Div. (DGD)	H2	?	0.0000	0.0050	0.0046	0.0048	0.0072	0.0264
Loan Div. (LD)	H3	?	0.0027	0.0032	-0.0025	0.0049	0.0115	0.0085
Security Div. (SD)	H4	?	0.0035	0.0024	0.0055	0.0026 **	0.0085	0.0069
Non-interest-income Div. (NIID)	H5	?	0.0070	0.0020 ***	0.0098	0.0021 ***	0.0047	0.0059
Off-balance-sheet Div. (OBSD)	H6	?	0.0004	0.0024	0.0012	0.0030	0.0042	0.0027
Scale variables								
Cross-border Loan Exposure Ratio	S1	-	0.0000	0.0000	0.0000	0.0000 *	-0.0001	0.0002
Deposit Ratio	S2	-	-0.0031	0.0012 **	-0.0038	0.0014 ***	0.0037	0.0040
Loan Ratio	S3	+	-0.0022	0.0036	-0.0049	0.0041	0.0028	0.0078
Security Ratio	S4	+	0.0030	0.0030	0.0027	0.0035	0.0143	0.0064 **
Non-interest-income Ratio	S5	+	0.1576	0.0852 *	0.1393	0.1871	0.1776	0.2475
Off-balance-sheet Ratio	S6	?	-0.0001	0.0000 **	-0.0001	0.0000 **	0.0000	0.0000
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	0.0001	0.0000	0.0001	0.0000	0.0008	0.0012
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0005	0.0024	0.0007	0.0026	0.0049	0.0510
Loan Div. (LD)	H3*S3	?	0.0093	0.0055 *	0.0130	0.0069 *	-0.0052	0.0128
Security Div. (SD)	H4*S4	?	-0.0043	0.0044	-0.0034	0.0050	-0.0118	0.0093
Non-interest-income Div. (NIID)	H5*S5	?	-0.1152	0.1853	-0.1345	0.3860	-0.2352	0.3227
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0001	0.0001 **	0.0001	0.0001 *	0.0000	0.0001
Activity interaction								
IGD*LD	H1*H3	?	-0.0036	0.0043	0.0027	0.0064	-0.0210	0.0126
IGD*NIID	H1*H5	?	-0.0056	0.0028 **	-0.0081	0.0027 ***	0.0023	0.0061
DGD * LD	H2*H3	+	0.0033	0.0083	-0.0036	0.0076	0.0323	0.0395
DGD * NIID	H2*H5	+	0.0006	0.0028	-0.0024	0.0028	-0.0419	0.0244
SD * OBSD	H4*H6	+	-0.0048	0.0033	-0.0094	0.0040 **	-0.0139	0.0102
All Activities	H1*H2*H3*H4*H5*H6	+	-0.0165	0.0152	-0.0064	0.0131	0.0928	0.0753
Control variables								
Log Asset	C1	?	0.0002	0.0004	0.0001	0.0004	0.0013	0.0014
Equity Ratio	C2	?	0.0052	0.0038	0.0059	0.0054	0.0264	0.0087 ***
Asset Growth	C3	+	0.0003	0.0003	0.0003	0.0003	-0.0002	0.0013
Merger Dummy	C4	?	-0.0002	0.0002	-0.0001	0.0002	0.0038	0.0053
Merger * Asset Growth	C4*C3	?	0.0000	0.0006	-0.0001	0.0007	-0.0150	0.0212
Year 1999 Dummy	Y99		0.0000	0.0002	0.0001	0.0002		
Year 2000 Dummy	Y00		0.0002	0.0002	0.0003	0.0002		
Year 2001 Dummy	Y01		0.0002	0.0003	0.0002	0.0004		
Year 2002 Dummy	Y02		0.0007	0.0004 *	0.0006	0.0005		
Year 2003 Dummy	Y03		0.0004	0.0004	0.0004	0.0006		
Year 2004 Dummy	Y04		0.0001	0.0004	0.0001	0.0006		
Year 2005 Dummy	Y05		0.0000	0.0004	-0.0001	0.0006		
Year 2006 Dummy	Y06		-0.0004	0.0004	-0.0004	0.0006		
Year 2007 Dummy	Y07		-0.0004	0.0004				
Year 2008 Dummy	Y08		0.0004	0.0004			0.0004	0.0002 *
First-order Coefficient of Autocorrelation	AR(1)		-0.0499	0.0903	-0.1344	0.0805 *	0.3186	0.3608
Observations			245		197		47	
Adjusted R-squared			0.5036		0.4595		0.8630	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 57: Maturity Gap (MG) Regressions for International BHCs

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	MG	Std. Error	MG	Std. Error	MG	Std. Error
Activity diversification								
	C		-1.1682	0.4155 ***	-0.3304	0.9359	-1.2111	0.7779
International Geographic Div. (IGD)	H1	?	0.8216	0.3368 **	0.1573	0.7518	0.0064	0.4873
Domestic Geographic Div. (DGD)	H2	?	-1.7115	0.3780 ***	-1.5258	0.3298 ***	2.6796	2.1433
Loan Div. (LD)	H3	?	1.6223	0.4359 ***	0.5985	1.0922	-0.3822	0.5703
Security Div. (SD)	H4	?	0.1237	0.1816	-0.1009	0.2644	0.6440	0.4263
Non-interest-income Div. (NIID)	H5	?	-0.3501	0.2647	-0.2572	0.3346	0.4072	0.5591
Off-balance-sheet Div. (OBSD)	H6	?	0.1587	0.1114	-0.0203	0.1154	0.1947	0.1849
Scale variables								
Cross-border Loan Exposure Ratio	S1	-	0.0044	0.0044	-0.0017	0.0041	0.0242	0.0098 **
Deposit Ratio	S2	-	0.2951	0.0945 ***	0.3919	0.1112 ***	0.0508	0.2845
Loan Ratio	S3	+	0.1996	0.3101	0.0098	0.3631	-3.4095	1.5363 **
Security Ratio	S4	+	-0.1585	0.2092	-0.4156	0.1887 **	1.1218	0.7943
Non-interest-income Ratio	S5	+	-12.3066	16.3404	-12.3784	26.8252	4.7157	16.6718
Off-balance-sheet Ratio	S6	?	0.0017	0.0045	0.0003	0.0083	-0.0054	0.0032
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	-0.0049	0.0072	0.0024	0.0065	-0.0293	0.0234
Domestic Geographic Div. (DGD)	H2*S2	?	0.1464	0.1646	-0.0254	0.2506	0.1046	3.1572
Loan Div. (LD)	H3*S3	?	-0.9589	0.4802 *	-0.7645	0.4783	5.6413	2.4496 **
Security Div. (SD)	H4*S4	?	-0.0446	0.3194	0.2018	0.3389	-1.6829	1.0678
Non-interest-income Div. (NIID)	H5*S5	?	10.1759	23.0271	14.4234	39.4401	-4.5507	21.1398
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0074	0.0076	-0.0064	0.0139	-0.0011	0.0074
Activity interaction								
IGD*LD	H1*H3	?	-1.8756	0.5406 ***	-0.4310	1.3649	0.7054	0.9455
IGD*NIID	H1*H5	?	0.0642	0.1960	-0.1226	0.1752	-0.8751	0.5755
DGD * LD	H2*H3	+	1.7536	0.5114 ***	1.6140	0.5605 ***	-7.2756	3.3953 **
DGD * NIID	H2*H5	+	0.7095	0.3232 **	0.7174	0.4254 *	1.7252	1.9063
SD * OBSD	H4*H6	+	-0.3869	0.2474	-0.0675	0.3397	-0.9870	0.6235
All Activities	H1*H2*H3*H4*H5*H6	+	-0.1917	0.6868	-0.3321	0.6415	-0.1028	3.5545
Control variables								
Log Asset	C1	?	0.1107	0.0154 ***	0.0879	0.0167 ***	0.1536	0.0915
Equity Ratio	C2	?	1.7183	0.4662 ***	1.0632	0.5224 **	1.1174	1.3256
Asset Growth	C3	+	0.1353	0.0708 *	0.0451	0.0464	0.0258	0.1188
Merger Dummy	C4	?	0.0093	0.0158	0.0090	0.0122	-0.7358	1.0121
Merger * Asset Growth	C4*C3	?	-0.1825	0.0729 **	-0.0943	0.0534 *	2.8660	3.9867
Year 1999 Dummy	Y99		-0.0529	0.0157 ***	-0.0536	0.0131 ***		
Year 2000 Dummy	Y00		-0.0712	0.0176 ***	-0.0685	0.0170 ***		
Year 2001 Dummy	Y01		-0.0680	0.0272 **	-0.0538	0.0258 **		
Year 2002 Dummy	Y02		-0.0711	0.0343 **	-0.0550	0.0298 *		
Year 2003 Dummy	Y03		-0.1206	0.0305 ***	-0.0928	0.0313 ***		
Year 2004 Dummy	Y04		-0.1298	0.0291 ***	-0.0892	0.0316 ***		
Year 2005 Dummy	Y05		-0.1388	0.0311 ***	-0.0951	0.0327 ***		
Year 2006 Dummy	Y06		-0.1688	0.0298 ***	-0.1285	0.0308 ***		
Year 2007 Dummy	Y07		-0.1834	0.0340 ***				
Year 2008 Dummy	Y08		-0.1809	0.0329 ***			0.0034	0.0212
First-order Coefficient of Autocorrelation	AR(1)		0.2342	0.0776 ***	0.1433	0.0730 *	-0.6135	0.3351 *
Observations			245		197		47	
Adjusted R-squared			0.7803		0.7720		0.9330	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 58: Derivatives Loss (DL) Regressions for International BHCs**

			Total period		Before the Crisis		During the Crisis	
Variables	Variable Abbreviation	Expected Sign	DL	Std. Error	DL	Std. Error	DL	Std. Error
Activity diversification								
	C		-0.0003	0.0001 *	0.0000	0.0003	-0.0003	0.0009
International Geographic Div. (IGD)	H1	?	0.0002	0.0002	-0.0001	0.0004	-0.0005	0.0006
Domestic Geographic Div. (DGD)	H2	?	0.0002	0.0003	0.0002	0.0004	-0.0079	0.0047
Loan Div. (LD)	H3	?	0.0004	0.0002 *	-0.0001	0.0005	-0.0019	0.0011
Security Div. (SD)	H4	?	-0.0001	0.0001	-0.0001	0.0002	0.0000	0.0008
Non-interest-income Div. (NIID)	H5	?	-0.0001	0.0001	0.0001	0.0002	-0.0007	0.0007
Off-balance-sheet Div. (OBSD)	H6	?	0.0000	0.0001	0.0000	0.0001	0.0001	0.0005
Scale variables								
Cross-border Loan Exposure Ratio	S1	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deposit Ratio	S2	-	0.0001	0.0001	0.0001	0.0001	0.0007	0.0004 *
Loan Ratio	S3	+	0.0001	0.0002	0.0000	0.0003	-0.0024	0.0014 *
Security Ratio	S4	+	0.0001	0.0001	0.0001	0.0002	0.0016	0.0011
Non-interest-income Ratio	S5	+	-0.0052	0.0084	0.0001	0.0088	-0.0486	0.0257 *
Off-balance-sheet Ratio	S6	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Domestic Geographic Div. (DGD)	H2*S2	?	0.0000	0.0001	0.0000	0.0002	0.0147	0.0039 ***
Loan Div. (LD)	H3*S3	?	-0.0002	0.0003	-0.0002	0.0004	0.0051	0.0024 *
Security Div. (SD)	H4*S4	?	-0.0001	0.0002	0.0000	0.0004	-0.0020	0.0018
Non-interest-income Div. (NIID)	H5*S5	?	0.0098	0.0190	-0.0115	0.0156	0.0975	0.0420 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Activity interaction								
IGD*LD	H1*H3	?	-0.0005	0.0003 *	0.0001	0.0007	0.0007	0.0018
IGD*NIID	H1*H5	?	0.0001	0.0001	0.0000	0.0002	-0.0001	0.0010
DGD * LD	H2*H3	+	-0.0003	0.0004	-0.0002	0.0006	0.0084	0.0086
DGD * NIID	H2*H5	+	-0.0001	0.0002	-0.0002	0.0002	-0.0079	0.0034 **
SD * OBSD	H4*H6	+	0.0001	0.0002	0.0000	0.0003	0.0012	0.0013
All Activities	H1*H2*H3*H4*H5*H6	+	0.0007	0.0006	0.0009	0.0007	0.0315	0.0056 ***
Control variables								
Log Asset	C1	?	0.0000	0.0000 **	0.0000	0.0000	0.0001	0.0001
Equity Ratio	C2	?	-0.0005	0.0004	-0.0006	0.0005	-0.0032	0.0018 *
Asset Growth	C3	+	0.0000	0.0000	0.0000	0.0000	-0.0004	0.0002 *
Merger Dummy	C4	?	0.0000	0.0000	0.0000	0.0000	0.0039	0.0015 **
Merger * Asset Growth	C4*C3	?	0.0001	0.0000	0.0000	0.0001	-0.0153	0.0060 **
Year 1999 Dummy	Y99		0.0000	0.0000	0.0000	0.0000		
Year 2000 Dummy	Y00		0.0000	0.0000	0.0000	0.0000		
Year 2001 Dummy	Y01		0.0000	0.0000	0.0000	0.0000		
Year 2002 Dummy	Y02		0.0000	0.0000	0.0000	0.0000		
Year 2003 Dummy	Y03		0.0000	0.0000	0.0000	0.0000		
Year 2004 Dummy	Y04		0.0000	0.0000	0.0000	0.0000		
Year 2005 Dummy	Y05		0.0000	0.0000	0.0000	0.0000		
Year 2006 Dummy	Y06		0.0000	0.0000	0.0000	0.0000		
Year 2007 Dummy	Y07		0.0000	0.0000				
Year 2008 Dummy	Y08		0.0000	0.0000			0.0000	0.0000
First-order Coefficient of Autocorrelation	AR(1)		0.1697	0.1769	0.2828	0.0837 ***	-0.7897	0.2161 ***
Observations			245		197		47	
Adjusted R-squared			0.0134		0.0694		0.4558	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 59: Market Beta (MB) Regressions for International BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MB	Std. Error	MB	Std. Error	MB	Std. Error
Activity diversification								
	C		-3.0311	0.7580 ***	1.0542	0.6273 *	17.6366	46.5330
International Geographic Div. (IGD)	H1	?	0.5281	0.4316	-0.5079	0.6790	1.3415	2.8090
Domestic Geographic Div. (DGD)	H2	?	0.9384	0.9245	0.7505	0.6504	-4.7187	15.0382
Loan Div. (LD)	H3	?	0.8251	0.6473	-0.4643	1.1082	2.5271	3.9975
Security Div. (SD)	H4	?	0.6125	0.3385 *	-0.2823	0.3472	9.2622	4.3244 **
Non-interest-income Div. (NIID)	H5	?	-0.2151	0.3814	-0.0451	0.3435	-1.0775	2.1204
Off-balance-sheet Div. (OBSD)	H6	?	0.1103	0.1996	0.0514	0.1394	2.2256	1.7024
Scale variables								
Cross-border Loan Exposure Ratio	S1	-	-0.0117	0.0051 **	-0.0007	0.0038	-0.0649	0.0400
Deposit Ratio	S2	-	-0.1079	0.2878	-0.3681	0.1558 **	-1.6490	1.5293
Loan Ratio	S3	+	0.3297	0.8727	-0.5549	0.4098	6.8867	7.9288
Security Ratio	S4	+	0.0353	0.5066	-0.3092	0.3486	5.6830	4.3155
Non-interest-income Ratio	S5	+	1.8512	13.3797	1.6443	9.6903	-27.0433	65.9860
Off-balance-sheet Ratio	S6	?	-0.0120	0.0083	0.0003	0.0086	-0.0470	0.0311
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	0.0126	0.0076 *	-0.0041	0.0078	0.0627	0.0683
Domestic Geographic Div. (DGD)	H2*S2	?	-0.2831	0.3112	-0.3495	0.2270	27.8847	15.1399 *
Loan Div. (LD)	H3*S3	?	-0.0263	1.6339	0.6333	0.7020	-16.6265	13.0294
Security Div. (SD)	H4*S4	?	0.6757	0.8723	0.6580	0.5390	-15.4522	9.7856
Non-interest-income Div. (NIID)	H5*S5	?	-8.6907	23.2567	-2.7504	18.6520	26.8198	91.4321
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0122	0.0142	-0.0040	0.0146	0.1305	0.0596 **
Activity interaction								
IGD*LD	H1*H3	?	-1.5262	0.8854 *	0.7271	1.4148	-3.0028	7.9670
IGD*NIID	H1*H5	?	0.2129	0.4455	0.1690	0.3530	1.5516	4.0453
DGD * LD	H2*H3	+	-1.6307	1.3439	-0.9204	0.9868	-0.6376	24.9086
DGD * NIID	H2*H5	+	0.2346	0.4970	0.0149	0.3422	-8.7048	13.5806
SD * OBSD	H4*H6	+	-1.0092	0.4692 **	0.3635	0.4697	-13.3629	5.9356 **
All Activities	H1*H2*H3*H4*H5*H6	+	0.4119	1.6182	-0.1105	1.3023	26.4672	34.7167
Control variables								
Log Asset	C1	?	0.5044	0.0859 ***	0.0892	0.0418 **	-0.8025	0.6701
Equity Ratio	C2	?	-3.8648	1.2634 ***	-0.3306	0.9118	4.9725	6.8231
Asset Growth	C3	+	-0.0227	0.0245	-0.0112	0.0162	-0.0572	0.5486
Merger Dummy	C4	?	0.0521	0.0355	0.0214	0.0375	-2.3755	1.8756
Merger * Asset Growth	C4*C3	?	-0.0798	0.1007	-0.0682	0.0777	10.5913	7.2094
Year 1999 Dummy	Y99		0.0004	0.0162	-0.0241	0.0138 *		
Year 2000 Dummy	Y00		0.0100	0.0342	-0.0247	0.0281		
Year 2001 Dummy	Y01		0.0095	0.0633	-0.0664	0.0384 *		
Year 2002 Dummy	Y02		0.0314	0.0712	-0.0670	0.0404 *		
Year 2003 Dummy	Y03		0.0052	0.0848	-0.0997	0.0473 **		
Year 2004 Dummy	Y04		-0.0378	0.0904	-0.1274	0.0492 **		
Year 2005 Dummy	Y05		-0.0830	0.0986	-0.1694	0.0493 ***		
Year 2006 Dummy	Y06		-0.0688	0.0855	-0.2180	0.0440 ***		
Year 2007 Dummy	Y07		-0.0352	0.1051				
Year 2008 Dummy	Y08		0.1024	0.1085			-0.0130	0.1078
First-order Coefficient of Autocorrelation	AR(1)		0.9656	0.0221 ***	0.9697	0.0237 ***	0.9932	0.0303 ***
Observations			245		197		47	
Adjusted R-squared			0.9327		0.9755		0.7419	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 60: Interest Rate Beta (IRB) Regressions for International BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			IRB	Std. Error	IRB	Std. Error	IRB	Std. Error
Activity diversification								
	C		-0.1649	0.7521	-0.2262	1.1538	-1.1689	2.9281
International Geographic Div. (IGD)	H1	?	-0.6526	0.4869	-1.6622	1.1870	-0.8252	1.2122
Domestic Geographic Div. (DGD)	H2	?	-0.3350	0.8155	-0.1069	0.7977	10.1879	10.8782
Loan Div. (LD)	H3	?	-1.1887	0.6644 *	-2.7747	1.7480	-2.3679	2.6152
Security Div. (SD)	H4	?	-0.5784	0.4882	-0.6377	0.6177	1.4143	1.7547
Non-interest-income Div. (NIID)	H5	?	0.2588	0.2753	0.3918	0.3441	0.6799	2.4275
Off-balance-sheet Div. (OBSD)	H6	?	-0.1899	0.2108	-0.3893	0.2103 *	0.5069	1.2664
Scale variables								
Cross-border Loan Exposure Ratio	S1	-	0.0061	0.0041	-0.0044	0.0046	-0.0286	0.0433
Deposit Ratio	S2	-	0.1729	0.2312	0.4776	0.2267 **	0.5181	1.1141
Loan Ratio	S3	+	-0.5728	0.7154	-0.0454	0.6571	-4.8932	3.6311
Security Ratio	S4	+	-0.6260	0.4837	-0.9052	0.5378 *	1.8644	2.0865
Non-interest-income Ratio	S5	+	1.9670	13.4893	10.4457	15.1530	-21.7151	80.2465
Off-balance-sheet Ratio	S6	?	0.0028	0.0075	0.0026	0.0112	-0.0214	0.0215
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	0.0010	0.0069	0.0158	0.0075 **	0.0666	0.1241
Domestic Geographic Div. (DGD)	H2*S2	?	0.2383	0.4569	0.0516	0.4987	-14.6748	10.8636
Loan Div. (LD)	H3*S3	?	0.6864	1.2759	-0.0854	1.0929	8.0723	6.4439
Security Div. (SD)	H4*S4	?	0.9499	0.7842	1.5817	0.9003 *	-1.1760	3.5611
Non-interest-income Div. (NIID)	H5*S5	?	1.8102	21.5796	-27.1390	26.6483	29.4918	114.2248
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0031	0.0130	-0.0002	0.0190	0.0269	0.0357
Activity interaction								
IGD*LD	H1*H3	?	1.4633	0.8929	3.2498	2.2440	0.1361	3.7028
IGD*NIID	H1*H5	?	-0.4211	0.3405	-0.4235	0.3651	1.3149	2.9368
DGD * LD	H2*H3	+	0.5605	1.1665	0.2107	1.0865	-2.0407	18.4596
DGD * NIID	H2*H5	+	-0.0929	0.4747	0.0700	0.4923	-2.8176	7.3356
SD * OBSD	H4*H6	+	0.7566	0.6503	0.6847	0.8416	-2.7690	2.7297
All Activities	H1*H2*H3*H4*H5*H6	+	-0.5327	1.6449	-0.6161	1.7273	-18.3530	15.2025
Control variables								
Log Asset	C1	?	0.0919	0.0684	0.2178	0.0682 ***	0.1330	0.2438
Equity Ratio	C2	?	2.5555	1.0282 **	-0.5839	1.1196	4.0107	3.9654
Asset Growth	C3	+	0.0201	0.0293	0.0373	0.0289	-0.3809	0.4570
Merger Dummy	C4	?	-0.0694	0.0324 **	-0.0195	0.0362	2.0154	2.8242
Merger * Asset Growth	C4*C3	?	0.0778	0.0861	0.0201	0.0753	-7.8017	11.1765
Year 1999 Dummy	Y99		-0.0421	0.0261	-0.0115	0.0217		
Year 2000 Dummy	Y00		-0.0238	0.0351	0.0218	0.0336		
Year 2001 Dummy	Y01		-0.0575	0.0585	0.0207	0.0527		
Year 2002 Dummy	Y02		-0.0768	0.0606	0.0004	0.0551		
Year 2003 Dummy	Y03		-0.0611	0.0743	0.0092	0.0642		
Year 2004 Dummy	Y04		-0.0853	0.0769	-0.0370	0.0645		
Year 2005 Dummy	Y05		-0.0802	0.0795	-0.0458	0.0640		
Year 2006 Dummy	Y06		-0.1004	0.0702	-0.0174	0.0552		
Year 2007 Dummy	Y07		-0.0816	0.0787				
Year 2008 Dummy	Y08		-0.1796	0.0808 **			-0.0885	0.0766
First-order Coefficient of Autocorrelation	AR(1)		0.8032	0.0567 ***	0.9019	0.0393 ***	-0.5468	0.3487
Observations			245		197		47	
Adjusted R-squared			0.6462		0.7326		0.6174	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 61: Distance to Default (Z-Score) Regressions for International BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			Z	Std. Error	Z	Std. Error	Z	Std. Error
Activity diversification								
	C		1623.40	351.31 ***	860.82	559.05	135.29	666.94
International Geographic Div. (IGD)	H1	?	-1395.75	381.11 ***	-1760.68	663.35 ***	518.72	684.78
Domestic Geographic Div. (DGD)	H2	?	689.57	426.48	747.54	473.01	-6594.94	2441.46 **
Loan Div. (LD)	H3	?	-821.88	433.93 *	-1083.24	925.78	1694.82	1026.08
Security Div. (SD)	H4	?	214.93	269.31	341.48	298.68	-1341.74	583.77 **
Non-interest-income Div. (NIID)	H5	?	-467.28	222.19 **	-701.84	284.06 **	369.30	264.82
Off-balance-sheet Div. (OBSD)	H6	?	33.20	127.78	33.87	149.35	-780.29	296.77 **
Scale variables								
Cross-border Loan Exposure Ratio	S1	+	-2.42	4.18	-2.26	4.30	-7.39	4.24
Deposit Ratio	S2	+	136.54	101.23	254.42	119.51 **	-109.91	217.02
Loan Ratio	S3	?	-145.13	252.83	-153.84	348.56	2244.68	712.98 ***
Security Ratio	S4	?	-477.51	321.26	-257.82	304.34	-1656.17	704.94 **
Non-interest-income Ratio	S5	?	11737.15	5401.95 **	17086.71	5761.06 ***	-9299.58	15730.47
Off-balance-sheet Ratio	S6	?	-5.61	3.54	-8.88	5.23 *	2.90	5.15
Scale interaction								
International Geographic Div. (IGD)	H1*S1	?	3.56	5.71	4.10	5.97	-1.83	9.69
Domestic Geographic Div. (DGD)	H2*S2	?	193.64	161.30	179.60	175.91	6725.02	4049.03
Loan Div. (LD)	H3*S3	?	-452.72	428.95	-458.98	621.05	-3584.68	1344.50 **
Security Div. (SD)	H4*S4	?	346.44	504.92	125.36	536.45	3209.13	1095.25 **
Non-interest-income Div. (NIID)	H5*S5	?	-18100.27	9075.98 **	-24075.22	10283.44 **	11018.99	25517.57
Off-balance-sheet Div. (OBSD)	H6*S6	?	7.42	6.71	8.67	9.67	-3.84	9.23
Activity interaction								
IGD*LD	H1*H3	?	1409.05	660.37 **	1725.50	1234.76	-3013.57	1812.88
IGD*NIID	H1*H5	?	909.63	297.00 ***	1211.33	346.96 ***	1680.43	729.96 **
DGD * LD	H2*H3	?	-806.65	610.00	-814.79	688.83	15317.57	4740.39 ***
DGD * NIID	H2*H5	?	-675.30	238.80 ***	-698.24	251.57 ***	-8299.36	3285.53 **
SD * OBSD	H4*H6	?	-533.44	347.21	-591.73	401.31	1855.05	955.24 *
All Activities	H1*H2*H3*H4*H5*H6	?	1987.77	792.14 **	1471.16	723.61 **	9834.97	4762.92 *
Control variables								
Log Asset	C1	?	-71.29	42.46 *	37.00	50.42	-65.69	84.94
Equity Ratio	C2	?	1824.73	493.62 ***	2752.34	674.91 ***	-1678.13	1810.91
Asset Growth	C3	-	2.17	12.02	-17.46	15.39	223.23	129.53
Merger Dummy	C4	?	-0.60	15.83	-23.00	24.06	2669.09	1345.57 *
Merger * Asset Growth	C4*C3	?	-74.01	38.27 *	-25.83	39.28	-10634.91	5289.33 *
Year 1999 Dummy	Y99		6.15	22.43	5.35	26.68		
Year 2000 Dummy	Y00		2.82	21.87	0.52	25.66		
Year 2001 Dummy	Y01		-58.70	33.90 *	-60.80	39.89		
Year 2002 Dummy	Y02		-66.67	34.52 *	-66.01	43.30		
Year 2003 Dummy	Y03		-65.12	37.10 *	-60.21	46.71		
Year 2004 Dummy	Y04		-67.93	38.79 *	-60.60	47.19		
Year 2005 Dummy	Y05		-67.80	41.26	-48.84	49.64		
Year 2006 Dummy	Y06		-53.87	34.43	-22.16	40.29		
Year 2007 Dummy	Y07		-45.48	39.57				
Year 2008 Dummy	Y08		-76.88	41.61 *			1.26	17.10
First-order Coefficient of Autocorrelation	AR(1)		0.91	0.04 ***	0.86	0.05 ***	-0.74	0.24 ***
Observations			245		197		47	
Adjusted R-squared			0.7942		0.8008		0.8675	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

## Appendix 62: Return on Asset (ROA) Regressions for All BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROA	Std. Error	ROA	Std. Error	ROA	Std. Error
Activity diversification								
	C		-0.0061	0.0012 ***	-0.0069	0.0015 ***	-0.0140	0.0035 ***
Domestic Geographic Div. (DGD)	H2	?	-0.0116	0.0041 ***	-0.0118	0.0039 ***	-0.0106	0.0089
Loan Div. (LD)	H3	?	0.0064	0.0025 **	0.0079	0.0029 ***	0.0128	0.0034 ***
Security Div. (SD)	H4	?	-0.0015	0.0004 ***	-0.0014	0.0005 ***	-0.0011	0.0012
Non-interest-income Div. (NIID)	H5	?	0.0024	0.0010 **	0.0025	0.0008 ***	0.0026	0.0010 **
Off-balance-sheet Div. (OBSD)	H6	?	-0.0007	0.0004	-0.0006	0.0004	-0.0014	0.0012
Scale variables								
Deposit Ratio	S2	+	0.0004	0.0009	-0.0001	0.0013	0.0000	0.0008
Loan Ratio	S3	+	0.0105	0.0022 ***	0.0108	0.0023 ***	0.0171	0.0037 ***
Security Ratio	S4	+	0.0036	0.0007 ***	0.0028	0.0009 ***	0.0120	0.0034 ***
Non-interest-income Ratio	S5	+	0.4718	0.1155 ***	0.5450	0.1088 ***	0.2739	0.0853 ***
Off-balance-sheet Ratio	S6	?	-0.0001	0.0001	-0.0002	0.0002	0.0000	0.0003
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0051	0.0034	0.0048	0.0037	0.0066	0.0103
Loan Div. (LD)	H3*S3	?	-0.0102	0.0038 ***	-0.0136	0.0043 ***	-0.0149	0.0048 ***
Security Div. (SD)	H4*S4	?	0.0048	0.0012 ***	0.0030	0.0015 **	0.0031	0.0038
Non-interest-income Div. (NIID)	H5*S5	?	-0.3824	0.2131 *	-0.3742	0.1764 **	-0.2042	0.2049
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0002	0.0002	0.0003	0.0002	0.0001	0.0005
Activity interaction								
DGD * LD	H2*H3	?	0.0087	0.0031 ***	0.0108	0.0036 ***	0.0024	0.0062
DGD * NIID	H2*H5	?	0.0052	0.0020 ***	0.0033	0.0019 *	0.0066	0.0065
SD * OBSD	H4*H6	?	-0.0001	0.0008	-0.0005	0.0009	0.0014	0.0022
All Activities	H2*H3*H4*H5*H6	?	-0.0004	0.0062	0.0072	0.0072	-0.0096	0.0201
Control variables								
International Loan Activity Dummy	ILAD		0.0014	0.0003 ***	0.0008	0.0003 **	0.0022	0.0006 ***
Log Asset	C1	?	-0.0001	0.0001	0.0001	0.0001	-0.0006	0.0002 **
Equity Ratio	C2	?	0.0241	0.0061 ***	0.0211	0.0098 **	0.0365	0.0051 ***
Asset Growth	C3	+	0.0005	0.0010	-0.0006	0.0009	0.0092	0.0019 ***
Merger Dummy	C4	?	0.0001	0.0001	0.0000	0.0001	0.0003	0.0004
Merger * Asset Growth	C4*C3	?	-0.0017	0.0010	-0.0009	0.0009	-0.0091	0.0021 ***
Year 1999 Dummy	Y99		-0.0005	0.0002 ***	0.0000	0.0001		
Year 2000 Dummy	Y00		-0.0006	0.0002 ***	-0.0001	0.0001		
Year 2001 Dummy	Y01		-0.0024	0.0004 ***	-0.0017	0.0003 ***		
Year 2002 Dummy	Y02		-0.0020	0.0004 ***	-0.0013	0.0003 ***		
Year 2003 Dummy	Y03		-0.0022	0.0004 ***	-0.0015	0.0003 ***		
Year 2004 Dummy	Y04		-0.0022	0.0004 ***	-0.0015	0.0003 ***		
Year 2005 Dummy	Y05		-0.0022	0.0004 ***	-0.0015	0.0003 ***		
Year 2006 Dummy	Y06		-0.0023	0.0004 ***	-0.0015	0.0003 ***		
Year 2007 Dummy	Y07		-0.0030	0.0005 ***				
Year 2008 Dummy	Y08		-0.0043	0.0005 ***			-0.0017	0.0001 ***
First-order Coefficient of Autocorrelation	AR(1)		0.4255	0.0611 ***	0.5880	0.0734 ***	0.2110	0.0335 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.5478		0.6412		0.3539	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



### Appendix 63: Risk Adjusted Return on Asset (RAROA) Regressions for All BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROA	Std. Error	RAROA	Std. Error	RAROA	Std. Error
Activity diversification								
	C		1.9899	3.6546	-22.5534	4.3878 ***	-13.8979	6.4850 **
Domestic Geographic Div. (DGD)	H2	?	-2.2761	3.8429	1.7911	4.9502	16.1598	7.8481 **
Loan Div. (LD)	H3	?	-0.0902	3.6876	9.4096	4.3128 **	12.7155	6.0577 **
Security Div. (SD)	H4	?	-0.2913	0.5894	-0.3095	0.6900	4.3269	2.1736 **
Non-interest-income Div. (NIID)	H5	?	1.0896	0.4141 ***	1.7480	0.5125 ***	0.5507	1.0368
Off-balance-sheet Div. (OBSD)	H6	?	-0.0697	0.9002	0.0376	1.0169	1.2425	2.0658
Scale variables								
Deposit Ratio	S2	+	3.2100	1.1123 ***	3.6243	1.3117 ***	3.8530	1.8011 **
Loan Ratio	S3	+	3.3997	2.8792	12.0162	3.4803 ***	10.9775	4.7185 **
Security Ratio	S4	+	2.7640	1.4386 *	1.9622	1.5853	14.3437	4.7621 ***
Non-interest-income Ratio	S5	?	0.0964	8.6921	3.4078	6.5029	-125.3711	30.8078 ***
Off-balance-sheet Ratio	S6	?	-0.0906	0.0641	-0.0573	0.0661	-0.0392	0.3532
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-2.6013	3.3508	-3.8201	4.5775	-13.7208	8.7288
Loan Div. (LD)	H3*S3	?	-0.3675	6.0878	-16.1682	6.9690 **	-13.7836	8.4741
Security Div. (SD)	H4*S4	?	4.9704	2.9026 *	2.1600	3.3962	-5.4338	7.4573
Non-interest-income Div. (NIID)	H5*S5	?	31.9750	25.5066	4.7555	18.5382	308.7365	102.9043 ***
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0867	0.1496	-0.2581	0.1628	0.0616	0.6171
Activity interaction								
DGD * LD	H2*H3	?	10.0537	6.1938	-0.1406	7.3815	-15.7133	11.4865
DGD * NIID	H2*H5	?	-1.7736	2.8312	-1.9682	3.0280	1.6946	5.5065
SD * OBSD	H4*H6	?	0.2449	1.5698	-0.1795	1.7460	-4.5204	3.6562
All Activities	H2*H3*H4*H5*H6	?	-5.4162	15.2478	-15.8665	15.4067	-31.4638	32.7300
Control variables								
International Loan Activity Dummy	ILAD	+	1.3652	1.5834	0.3070	1.9932	2.0028	2.0049
Log Asset	C1	?	0.1065	0.4611	3.1392	0.5635 ***	0.1593	0.6170
Equity Ratio	C2	?	19.0642	5.0188 ***	14.6998	4.8288 ***	32.8549	5.7797 ***
Asset Growth	C3	+	-1.3668	0.3936 ***	-1.7193	0.4300 ***	-0.6707	1.1281
Merger Dummy	C4	?	-0.2643	0.1524 *	0.0443	0.2042	-0.0542	0.5177
Merger * Asset Growth	C4*C3	?	-1.1502	0.9819	-3.8013	1.3167 ***	-0.4806	1.6464
Year 1999 Dummy	Y99		-0.6150	0.1210 ***	-0.2977	0.1259 **		
Year 2000 Dummy	Y00		-1.0971	0.1825 ***	-0.5233	0.1912 ***		
Year 2001 Dummy	Y01		-2.8219	0.3695 ***	-1.7544	0.3627 ***		
Year 2002 Dummy	Y02		-3.1650	0.4007 ***	-1.8762	0.3929 ***		
Year 2003 Dummy	Y03		-3.6026	0.4300 ***	-2.1447	0.4240 ***		
Year 2004 Dummy	Y04		-3.4022	0.4576 ***	-1.7652	0.4493 ***		
Year 2005 Dummy	Y05		-3.5848	0.4788 ***	-1.7685	0.4714 ***		
Year 2006 Dummy	Y06		-4.3037	0.4946 ***	-2.2129	0.4873 ***		
Year 2007 Dummy	Y07		-5.3333	0.5144 ***				
Year 2008 Dummy	Y08		-6.0996	0.5315 ***			-2.4089	0.1815 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8890	0.0073 ***	0.8863	0.0082 ***	0.7341	0.0222 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.7958		0.7956		0.5877	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 64: Return on Equity (ROE) Regressions for All BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			ROE	Std. Error	ROE	Std. Error	ROE	Std. Error
Activity diversification								
	C		-0.0175	0.0112	-0.0171	0.0090 *	-0.1891	0.0735 **
Domestic Geographic Div. (DGD)	H2	?	-0.0380	0.0266	-0.0101	0.0139	-0.1047	0.1199
Loan Div. (LD)	H3	?	0.0250	0.0161	0.0182	0.0099 *	0.1891	0.0702 ***
Security Div. (SD)	H4	?	-0.0062	0.0029 **	-0.0017	0.0022	-0.0141	0.0220
Non-interest-income Div. (NIID)	H5	?	0.0021	0.0033	-0.0007	0.0023	0.0147	0.0166
Off-balance-sheet Div. (OBSD)	H6	?	0.0053	0.0052	-0.0017	0.0033	0.0109	0.0243
Scale variables								
Deposit Ratio	S2	+	0.0158	0.0041 ***	0.0132	0.0035 ***	0.0107	0.0152
Loan Ratio	S3	+	0.0495	0.0139 ***	0.0357	0.0078 ***	0.2596	0.0847 ***
Security Ratio	S4	+	0.0238	0.0060 ***	0.0118	0.0047 **	0.1816	0.0692 ***
Non-interest-income Ratio	S5	+	0.9302	0.1447 ***	1.1289	0.1437 ***	-0.1161	0.4149
Off-balance-sheet Ratio	S6	?	0.0013	0.0009	-0.0008	0.0006	0.0034	0.0035
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0147	0.0200	-0.0318	0.0140 **	0.0008	0.1049
Loan Div. (LD)	H3*S3	?	-0.0405	0.0244 *	-0.0431	0.0160 ***	-0.2304	0.1001 **
Security Div. (SD)	H4*S4	?	0.0279	0.0116 **	-0.0028	0.0084	0.0638	0.0672
Non-interest-income Div. (NIID)	H5*S5	?	0.3216	0.4818	-0.0323	0.4380	4.2226	1.7064 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0023	0.0016	0.0008	0.0011	-0.0043	0.0062
Activity interaction								
DGD * LD	H2*H3	?	0.0557	0.0266 **	0.0404	0.0133 ***	0.0930	0.0960
DGD * NIID	H2*H5	?	0.0279	0.0146 *	0.0141	0.0100	0.0788	0.0895
SD * OBSD	H4*H6	?	-0.0121	0.0089	-0.0064	0.0054	-0.0102	0.0407
All Activities	H2*H3*H4*H5*H6	?	-0.0141	0.0535	-0.0052	0.0352	-0.0038	0.2209
Control variables								
International Loan Activity Dummy	ILAD		0.0182	0.0041 ***	0.0078	0.0025 ***	0.0383	0.0117 ***
Log Asset	C1	?	0.0007	0.0012	0.0044	0.0008 ***	-0.0113	0.0039 ***
Equity Ratio	C2	?	0.0355	0.0302	-0.0639	0.0207 ***	0.3417	0.1132 ***
Asset Growth	C3	+	0.0413	0.0092 ***	0.0046	0.0052	0.2137	0.0524 ***
Merger Dummy	C4	?	0.0009	0.0017	-0.0005	0.0008	0.0035	0.0084
Merger * Asset Growth	C4*C3	?	-0.0527	0.0111 ***	-0.0189	0.0070 ***	-0.2024	0.0557 ***
Year 1999 Dummy	Y99		-0.0025	0.0016	0.0012	0.0010		
Year 2000 Dummy	Y00		-0.0041	0.0018 **	0.0000	0.0012		
Year 2001 Dummy	Y01		-0.0130	0.0021 ***	-0.0044	0.0015 ***		
Year 2002 Dummy	Y02		-0.0110	0.0023 ***	-0.0026	0.0016 *		
Year 2003 Dummy	Y03		-0.0116	0.0023 ***	-0.0028	0.0016 *		
Year 2004 Dummy	Y04		-0.0121	0.0022 ***	-0.0035	0.0016 **		
Year 2005 Dummy	Y05		-0.0112	0.0023 ***	-0.0034	0.0017 **		
Year 2006 Dummy	Y06		-0.0115	0.0023 ***	-0.0034	0.0015 **		
Year 2007 Dummy	Y07		-0.0186	0.0024 ***				
Year 2008 Dummy	Y08		-0.0411	0.0037 ***			-0.0245	0.0023 ***
First-order Coefficient of Autocorrelation	AR(1)		0.2646	0.0591 ***	0.4408	0.0753 ***	0.1488	0.0571 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.1537		0.2696		0.1189	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 65: Risk Adjusted Rreturn on Equity (RAROE) Regressions for All BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RAROE	Std. Error	RAROE	Std. Error	RAROE	Std. Error
Activity diversification								
	C		3.3819	3.8134	-19.7731	4.7055 ***	-10.1586	5.9616 *
Domestic Geographic Div. (DGD)	H2	?	-1.8230	3.9707	4.1397	4.7380	9.8950	6.7746
Loan Div. (LD)	H3	?	3.7395	4.1148	14.2404	4.9231 ***	12.4603	6.0574 **
Security Div. (SD)	H4	?	0.4060	0.7341	0.3724	0.8342	3.0769	1.9044
Non-interest-income Div. (NIID)	H5	?	1.2280	0.4749 ***	1.7325	0.5787 ***	0.8047	0.9818
Off-balance-sheet Div. (OBSD)	H6	?	0.0450	1.0853	0.4469	1.2885	0.6351	1.8461
Scale variables								
Deposit Ratio	S2	+	2.7215	1.3752 **	3.2119	1.4966 **	3.4165	1.4873 **
Loan Ratio	S3	+	3.9577	2.9403	14.0015	3.6781 ***	11.7424	4.4324 ***
Security Ratio	S4	+	1.8895	1.5554	0.9886	1.8535	12.8131	4.5391 ***
Non-interest-income Ratio	S5	?	11.7278	5.3237 **	17.5221	5.7138 ***	-108.2209	47.9504 **
Off-balance-sheet Ratio	S6	?	-0.0944	0.0726	-0.0557	0.0804	-0.3608	0.4625
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.6343	4.2499	-4.7755	5.0885	-10.6622	8.0649
Loan Div. (LD)	H3*S3	?	-5.2828	6.1850	-22.8082	7.4515 ***	-14.2012	8.4322 *
Security Div. (SD)	H4*S4	?	4.8115	3.2758	2.4806	3.8188	-0.7461	7.1401
Non-interest-income Div. (NIID)	H5*S5	?	28.7158	24.3376	2.6623	18.8225	309.3526	127.0547 **
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0570	0.1599	-0.2702	0.1796	0.6061	0.8043
Activity interaction								
DGD * LD	H2*H3	?	2.6939	5.4967	-1.6486	6.2703	-5.9795	9.5343
DGD * NIID	H2*H5	?	-0.8409	3.1756	-1.9128	3.1773	2.5696	5.4682
SD * OBSD	H4*H6	?	-0.1478	1.7084	-0.8919	2.0117	-3.9246	3.4405
All Activities	H2*H3*H4*H5*H6	?	-15.4982	18.3173	-27.7844	19.1322	-40.7812	27.1793
Control variables								
International Loan Activity Dummy	ILAD	+	1.7923	1.6645	0.1448	2.1741	2.8996	1.9014
Log Asset	C1	?	0.1028	0.4415	2.7775	0.6595 ***	-0.2733	0.5818
Equity Ratio	C2	?	2.2486	4.3009	-3.8244	4.4529	21.7329	5.1473 ***
Asset Growth	C3	+	-0.3515	0.4154	-0.7313	0.4734	0.6809	1.1227
Merger Dummy	C4	?	-0.2375	0.1388 *	-0.1213	0.1968	0.0292	0.4936
Merger * Asset Growth	C4*C3	?	-2.6540	1.0865 **	-4.5319	1.5123 ***	-2.5105	1.6268
Year 1999 Dummy	Y99		-0.5512	0.1510 ***	-0.2443	0.1508		
Year 2000 Dummy	Y00		-1.0616	0.2035 ***	-0.5190	0.2084 **		
Year 2001 Dummy	Y01		-3.1907	0.4256 ***	-2.1409	0.4370 ***		
Year 2002 Dummy	Y02		-3.4239	0.4582 ***	-2.1745	0.4704 ***		
Year 2003 Dummy	Y03		-3.8058	0.4870 ***	-2.4008	0.5017 ***		
Year 2004 Dummy	Y04		-3.8772	0.5190 ***	-2.3220	0.5352 ***		
Year 2005 Dummy	Y05		-4.0056	0.5461 ***	-2.2988	0.5588 ***		
Year 2006 Dummy	Y06		-4.7660	0.5658 ***	-2.8212	0.5819 ***		
Year 2007 Dummy	Y07		-5.8752	0.5872 ***				
Year 2008 Dummy	Y08		-6.6565	0.6083 ***			-2.2735	0.1900 ***
First-order Coefficient of Autocorrelation	AR(1)		0.8800	0.0096 ***	0.8761	0.0102 ***	0.7094	0.0317 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.7835		0.7788		0.555171	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 66: Stock Return (SR) Regressions for All BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			SR	Std. Error	SR	Std. Error	SR	Std. Error
Activity diversification								
	C		-0.0826	0.0500 *	-0.0598	0.0496	-0.8811	0.2682 ***
Domestic Geographic Div. (DGD)	H2	?	0.1245	0.0918	0.0118	0.0849	0.7304	0.3078 **
Loan Div. (LD)	H3	?	0.0596	0.0598	0.0607	0.0602	0.3682	0.2051 *
Security Div. (SD)	H4	?	0.0488	0.0187 ***	0.0596	0.0185 ***	0.0214	0.0892
Non-interest-income Div. (NIID)	H5	?	0.0166	0.0192	0.0154	0.0190	0.1883	0.0999 *
Off-balance-sheet Div. (OBSD)	H6	?	0.0155	0.0197	0.0344	0.0197 *	-0.1051	0.0747
Scale variables								
Deposit Ratio	S2	+	0.0538	0.0247 **	0.0677	0.0252 ***	0.0406	0.0872
Loan Ratio	S3	+	0.0386	0.0510	0.0751	0.0506	0.4300	0.2180 **
Security Ratio	S4	+	0.0987	0.0392 **	0.0541	0.0398	0.7438	0.2122 ***
Non-interest-income Ratio	S5	+	1.7212	2.7149	4.5353	2.6114 *	0.4285	12.4275
Off-balance-sheet Ratio	S6	?	-0.0029	0.0053	-0.0046	0.0051	-0.0001	0.0142
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.1055	0.0781	-0.0578	0.0774	-0.3951	0.3302
Loan Div. (LD)	H3*S3	?	-0.0684	0.0924	-0.1437	0.0930	-0.3180	0.3118
Security Div. (SD)	H4*S4	?	-0.0856	0.0669	-0.1065	0.0695	-0.1551	0.2605
Non-interest-income Div. (NIID)	H5*S5	?	-1.0301	4.9748	-10.4155	4.6790 **	8.9079	19.5945
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0058	0.0091	0.0086	0.0090	0.0042	0.0246
Activity interaction								
DGD * LD	H2*H3	?	-0.0691	0.1011	0.0611	0.0853	-0.0958	0.3171
DGD * NIID	H2*H5	?	-0.0134	0.0705	0.0000	0.0674	-0.5275	0.2875 *
SD * OBSD	H4*H6	?	-0.0464	0.0382	-0.0690	0.0374 *	0.0706	0.1433
All Activities	H2*H3*H4*H5*H6	?	-0.3048	0.2330	-0.1960	0.2252	-1.1246	0.7690
Control variables								
International Loan Activity Dummy	ILAD		0.0151	0.0103	0.0198	0.0117 *	-0.0255	0.0298
Log Asset	C1	?	-0.0013	0.0049	0.0033	0.0048	0.0074	0.0169
Equity Ratio	C2	?	0.1302	0.1163	-0.0730	0.1101	1.1866	0.3596 ***
Asset Growth	C3	+	0.1877	0.0465 ***	0.1684	0.0451 ***	0.1472	0.1251
Merger Dummy	C4	?	0.0029	0.0094	-0.0018	0.0094	0.0098	0.0348
Merger * Asset Growth	C4*C3	?	-0.1995	0.0592 ***	-0.1683	0.0611 ***	-0.1487	0.1435
Year 1999 Dummy	Y99		-0.0551	0.0164 ***	-0.0973	0.0146 ***		
Year 2000 Dummy	Y00		-0.0037	0.0160	-0.0466	0.0148 ***		
Year 2001 Dummy	Y01		0.0235	0.0170	-0.0092	0.0155		
Year 2002 Dummy	Y02		-0.0150	0.0167	-0.0440	0.0153 ***		
Year 2003 Dummy	Y03		0.0367	0.0166 **	0.0061	0.0151		
Year 2004 Dummy	Y04		-0.0085	0.0164	-0.0384	0.0149 **		
Year 2005 Dummy	Y05		-0.0377	0.0163 **	-0.0735	0.0147 ***		
Year 2006 Dummy	Y06		-0.0076	0.0163	-0.0417	0.0148 ***		
Year 2007 Dummy	Y07		-0.1033	0.0166 ***				
Year 2008 Dummy	Y08		-0.0799	0.0226 ***			0.0404	0.0126 ***
First-order Coefficient of Autocorrelation	AR(1)		-0.2188	0.0254 ***	-0.1319	***	-0.3673	0.0468 ***
Observations			4878		3926		951	
Adjusted R-squared			0.1273		0.0880		0.1607	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 67: Risk Adjusted Stoak Return (RASR) Regressions for All BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			RASR	Std. Error	RASR	Std. Error	RASR	Std. Error
Activity diversification								
	C		-0.6488	0.3353 *	-0.5410	0.3384	-5.9600	1.6509 ***
Domestic Geographic Div. (DGD)	H2	?	0.7192	0.5819	-0.0535	0.5808	4.9388	1.8202 ***
Loan Div. (LD)	H3	?	0.8153	0.4195 *	0.5844	0.4246	3.9194	1.4592 ***
Security Div. (SD)	H4	?	0.2790	0.1234 **	0.3971	0.1269 ***	-0.3016	0.5019
Non-interest-income Div. (NIID)	H5	?	0.0188	0.1279	0.0322	0.1298	0.9895	0.5493 *
Off-balance-sheet Div. (OBSD)	H6	?	0.0815	0.1361	0.2234	0.1380	-0.8343	0.4489 *
Scale variables								
Deposit Ratio	S2	+	0.4103	0.1588 ***	0.4633	0.1619 ***	0.6525	0.5664
Loan Ratio	S3	+	0.5332	0.3107 *	0.5995	0.3167 *	3.2873	1.2544 ***
Security Ratio	S4	+	0.7734	0.2682 ***	0.5137	0.2745 *	4.0571	1.2995 ***
Non-interest-income Ratio	S5	?	11.9267	15.7058	24.4016	15.8614	22.0335	60.0917
Off-balance-sheet Ratio	S6	?	-0.0239	0.0320	-0.0362	0.0326	-0.0076	0.0915
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.7375	0.5050	-0.4121	0.4985	-1.9954	2.1899
Loan Div. (LD)	H3*S3	?	-0.9732	0.6331	-1.0478	0.6426	-4.3765	2.1425 **
Security Div. (SD)	H4*S4	?	-0.4661	0.4830	-0.7757	0.5026	0.1617	1.7664
Non-interest-income Div. (NIID)	H5*S5	?	-3.2739	29.4612	-57.5344	28.6459 **	49.2194	99.5909
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0452	0.0551	0.0650	0.0561	0.0334	0.1612
Activity interaction								
DGD * LD	H2*H3	?	-0.3023	0.6213	0.4247	0.6229	0.0550	1.9011
DGD * NIID	H2*H5	?	0.1781	0.4627	0.4107	0.4865	-4.6560	2.0337 *
SD * OBSD	H4*H6	?	-0.2269	0.2709	-0.4104	0.2688	0.7194	0.8884
All Activities	H2*H3*H4*H5*H6	?	-3.1407	1.5296 **	-2.5655	1.5458 *	-7.4393	5.0568
Control variables								
International Loan Activity Dummy	ILAD	+	0.1158	0.0783	0.1190	0.0801	-0.0511	0.2328
Log Asset	C1	?	-0.0107	0.0327	0.0261	0.0329	0.0138	0.1124
Equity Ratio	C2	?	0.9697	0.7074	-0.0499	0.7145	7.5539	2.0720 ***
Asset Growth	C3	+	0.8510	0.2641 ***	0.7982	0.2567 ***	0.4457	0.7611
Merger Dummy	C4	?	0.0425	0.0717	-0.0090	0.0732	0.1744	0.2468
Merger * Asset Growth	C4*C3	?	-1.0270	0.3795 ***	-0.8502	0.4014 **	-0.4909	0.9570
Year 1999 Dummy	Y99		-0.5203	0.0996 ***	-0.7032	0.0958 ***		
Year 2000 Dummy	Y00		-0.1726	0.0999 *	-0.3609	0.0980 ***		
Year 2001 Dummy	Y01		0.0467	0.1042	-0.0850	0.1018		
Year 2002 Dummy	Y02		-0.2055	0.1033 **	-0.3202	0.1010 ***		
Year 2003 Dummy	Y03		0.2268	0.1036 **	0.1093	0.1015		
Year 2004 Dummy	Y04		-0.0325	0.1037	-0.1520	0.1014		
Year 2005 Dummy	Y05		-0.3481	0.1031 ***	-0.5040	0.1007 ***		
Year 2006 Dummy	Y06		0.0071	0.1040	-0.1353	0.1036		
Year 2007 Dummy	Y07		-1.0574	0.1067 ***				
Year 2008 Dummy	Y08		-0.7241	0.1304 ***			0.4157	0.0797 ***
First-order Coefficient of Autocorrelation	AR(1)		-0.1859	0.0165 ***	-0.1360	0.0164 ***	-0.3187	0.0329 ***
Observations			4878		3926		951	
Adjusted R-squared			0.1653		0.0968		0.1466	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 68: Net Charge Off (NCO) Regressions for All BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			NCO	Std. Error	NCO	Std. Error	NCO	Std. Error
Activity diversification								
	C		-0.0036	0.0010 ***	-0.0030	0.0011 ***	-0.0005	0.0023
Domestic Geographic Div. (DGD)	H2	?	-0.0015	0.0017	-0.0017	0.0016	-0.0036	0.0045
Loan Div. (LD)	H3	?	-0.0004	0.0013	-0.0005	0.0013	-0.0048	0.0026 *
Security Div. (SD)	H4	?	0.0003	0.0003	0.0002	0.0003	0.0000	0.0008
Non-interest-income Div. (NIID)	H5	?	-0.0006	0.0004 *	-0.0006	0.0003 *	0.0001	0.0005
Off-balance-sheet Div. (OBSD)	H6	?	0.0006	0.0003 **	0.0005	0.0002 **	0.0011	0.0007
Scale variables								
Deposit Ratio	S2	-	0.0003	0.0006	0.0006	0.0007	0.0002	0.0006
Loan Ratio	S3	?	0.0016	0.0010	0.0010	0.0010	-0.0023	0.0028
Security Ratio	S4	?	0.0000	0.0004	-0.0001	0.0005	-0.0035	0.0023
Non-interest-income Ratio	S5	?	0.0848	0.0445 *	0.0643	0.0398	0.2359	0.0353 ***
Off-balance-sheet Ratio	S6	?	-0.0001	0.0000 ***	0.0000	0.0000	-0.0002	0.0001
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0008	0.0018	-0.0004	0.0018	-0.0025	0.0051
Loan Div. (LD)	H3*S3	?	0.0005	0.0018	0.0015	0.0019	0.0058	0.0035 *
Security Div. (SD)	H4*S4	?	-0.0012	0.0010	0.0000	0.0009	-0.0009	0.0024
Non-interest-income Div. (NIID)	H5*S5	?	-0.0279	0.1208	-0.0297	0.1296	-0.4803	0.0843 ***
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0002	0.0001 **	0.0001	0.0001	0.0003	0.0002
Activity interaction								
DGD * LD	H2*H3	?	0.0023	0.0015	0.0026	0.0015 *	-0.0019	0.0032
DGD * NIID	H2*H5	?	0.0012	0.0009	0.0011	0.0009	0.0095	0.0037 ***
SD * OBSD	H4*H6	?	-0.0014	0.0005 ***	-0.0010	0.0005 **	-0.0015	0.0013
All Activities	H2*H3*H4*H5*H6	?	0.0008	0.0038	-0.0015	0.0039	-0.0024	0.0108
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0003	0.0003	0.0002	0.0002	-0.0008	0.0004 *
Log Asset	C1	?	0.0004	0.0001 ***	0.0003	0.0001 **	0.0006	0.0001 ***
Equity Ratio	C2	?	0.0045	0.0031	0.0070	0.0039 *	-0.0010	0.0023
Asset Growth	C3	+	0.0002	0.0003	0.0005	0.0003 *	-0.0028	0.0008 ***
Merger Dummy	C4	?	0.0000	0.0001	-0.0001	0.0000 *	0.0000	0.0003
Merger * Asset Growth	C4*C3	?	0.0001	0.0004	0.0002	0.0004	0.0017	0.0011
Year 1999 Dummy	Y99		0.0002	0.0001 ***	-0.0001	0.0001		
Year 2000 Dummy	Y00		0.0003	0.0001 ***	-0.0001	0.0001		
Year 2001 Dummy	Y01		0.0006	0.0002 **	0.0001	0.0002		
Year 2002 Dummy	Y02		0.0005	0.0002 **	0.0001	0.0002		
Year 2003 Dummy	Y03		0.0004	0.0002 **	0.0000	0.0002		
Year 2004 Dummy	Y04		0.0004	0.0002 *	-0.0001	0.0002		
Year 2005 Dummy	Y05		0.0003	0.0002	-0.0002	0.0002		
Year 2006 Dummy	Y06		0.0003	0.0002	-0.0002	0.0001 *		
Year 2007 Dummy	Y07		0.0006	0.0002 **				
Year 2008 Dummy	Y08		0.0011	0.0002 ***			0.0009	0.0001 ***
First-order Coefficient of Autocorrelation	AR(1)		0.5674	0.1171 ***	0.6392	0.1776 ***	0.3184	0.0439 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.4932		0.5434		0.3975	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

# Appendix 69: Maturity Gap (MG) Regressions for All BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MG	Std. Error	MG	Std. Error	MG	Std. Error
Activity diversification								
	C		0.0434	0.0820	-0.0273	0.0846	-0.0241	0.1596
Domestic Geographic Div. (DGD)	H2	?	-0.1234	0.0939	-0.1351	0.1175	-0.2723	0.1777
Loan Div. (LD)	H3	?	0.0742	0.1067	0.1375	0.1143	0.0873	0.1678
Security Div. (SD)	H4	?	0.0149	0.0161	0.0085	0.0181	0.0043	0.0721
Non-interest-income Div. (NIID)	H5	?	-0.0074	0.0107	0.0027	0.0120	-0.0081	0.0271
Off-balance-sheet Div. (OBSD)	H6	?	0.0579	0.0231 **	0.0500	0.0272 *	0.0927	0.0581
Scale variables								
Deposit Ratio	S2	-	-0.0442	0.0322	-0.0402	0.0370	-0.0481	0.0545
Loan Ratio	S3	?	0.0378	0.0780	0.0934	0.0842	0.1602	0.1424
Security Ratio	S4	?	-0.0450	0.0390	-0.0086	0.0417	-0.0241	0.1365
Non-interest-income Ratio	S5	?	0.5643	0.1645 ***	0.4830	0.1492 ***	2.7772	1.2895 **
Off-balance-sheet Ratio	S6	?	0.0047	0.0025 *	0.0045	0.0028	0.0257	0.0095 ***
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.0120	0.0996	0.0300	0.1418	-0.0823	0.1937
Loan Div. (LD)	H3*S3	?	-0.1252	0.1499	-0.2486	0.1648	-0.1344	0.2323
Security Div. (SD)	H4*S4	?	-0.0950	0.0702	-0.1650	0.0818 **	0.0021	0.2199
Non-interest-income Div. (NIID)	H5*S5	?	-1.5069	0.4297 ***	-1.3185	0.4178 ***	-4.0238	2.9469
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0123	0.0048 **	-0.0118	0.0055 **	-0.0473	0.0156 ***
Activity interaction								
DGD * LD	H2*H3	?	0.1814	0.1139	0.1513	0.1300	0.5756	0.2200 ***
DGD * NIID	H2*H5	?	0.0991	0.0632	0.1491	0.0698 **	0.0811	0.1408
SD * OBSD	H4*H6	?	-0.0730	0.0396 *	-0.0585	0.0475	-0.1816	0.1010 *
All Activities	H2*H3*H4*H5*H6	?	-0.4227	0.2565 *	-0.6580	0.3183 **	0.2583	0.6443
Control variables								
International Loan Activity Dummy	ILAD	+	0.0336	0.0415	0.0254	0.0478	0.0311	0.0283
Log Asset	C1	?	0.0193	0.0084 **	0.0244	0.0088 ***	0.0147	0.0120
Equity Ratio	C2	?	0.1187	0.1055	0.2013	0.1195 *	0.0928	0.1649
Asset Growth	C3	+	0.0403	0.0109 ***	0.0397	0.0118 ***	0.0874	0.0291 ***
Merger Dummy	C4	?	-0.0016	0.0030	0.0005	0.0040	0.0026	0.0067
Merger * Asset Growth	C4*C3	?	-0.0495	0.0190 ***	-0.0701	0.0251 ***	-0.0770	0.0380 **
Year 1999 Dummy	Y99		-0.0080	0.0034 **	-0.0086	0.0035 **		
Year 2000 Dummy	Y00		-0.0114	0.0049 **	-0.0122	0.0050 **		
Year 2001 Dummy	Y01		0.0086	0.0088	0.0078	0.0098		
Year 2002 Dummy	Y02		0.0107	0.0092	0.0095	0.0102		
Year 2003 Dummy	Y03		0.0194	0.0097 **	0.0174	0.0107		
Year 2004 Dummy	Y04		0.0202	0.0100 **	0.0179	0.0110		
Year 2005 Dummy	Y05		0.0206	0.0102 **	0.0180	0.0113		
Year 2006 Dummy	Y06		0.0091	0.0103	0.0067	0.0114		
Year 2007 Dummy	Y07		-0.0023	0.0106				
Year 2008 Dummy	Y08		-0.0082	0.0107			-0.0063	0.0041
First-order Coefficient of Autocorrelation	AR(1)		0.8504	0.0061 ***	0.8422	0.0070 ***	0.7802	0.0152 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.7385		0.7251		0.6347	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 70: Derivatives Loss (DL) Regressions for All BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			DL	Std. Error	DL	Std. Error	DL	Std. Error
Activity diversification								
	C		0.0000	0.0001	0.0000	0.0001	0.0000	0.0000
Domestic Geographic Div. (DGD)	H2	?	0.0000	0.0000	-0.0001	0.0000 **	0.0001	0.0001 **
Loan Div. (LD)	H3	?	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000
Security Div. (SD)	H4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Non-interest-income Div. (NIID)	H5	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-balance-sheet Div. (OBSD)	H6	?	0.0000	0.0000 *	0.0000	0.0000 *	0.0000	0.0000 ***
Scale variables								
Deposit Ratio	S2	-	0.0000	0.0000	0.0000	0.0000 *	0.0000	0.0000
Loan Ratio	S3	?	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000
Security Ratio	S4	?	0.0000	0.0000	-0.0001	0.0000 *	0.0001	0.0000 **
Non-interest-income Ratio	S5	?	0.0000	0.0000	0.0000	0.0001	0.0000	0.0003
Off-balance-sheet Ratio	S6	?	0.0000	0.0000 *	0.0000	0.0000 *	0.0000	0.0000
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0000	0.0000	0.0001	0.0000 **	-0.0004	0.0001 ***
Loan Div. (LD)	H3*S3	?	0.0000	0.0002	0.0000	0.0002	0.0000	0.0001
Security Div. (SD)	H4*S4	?	0.0000	0.0000	0.0001	0.0000 *	-0.0001	0.0001
Non-interest-income Div. (NIID)	H5*S5	?	0.0004	0.0004	0.0003	0.0005	0.0012	0.0011
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0000	0.0000 **	0.0000	0.0000 *	0.0000	0.0000
Activity interaction								
DGD * LD	H2*H3	?	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001 **
DGD * NIID	H2*H5	?	0.0001	0.0000	0.0000	0.0000	0.0003	0.0001 ***
SD * OBSD	H4*H6	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
All Activities	H2*H3*H4*H5*H6	?	-0.0003	0.0001 *	-0.0001	0.0001	-0.0010	0.0002 ***
Control variables								
International Loan Activity Dummy	ILAD	+	0.0000	0.0000 **	0.0000	0.0000 **	0.0000	0.0000
Log Asset	C1	?	0.0000	0.0000	0.0000	0.0000 **	0.0000	0.0000
Equity Ratio	C2	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Asset Growth	C3	+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger Dummy	C4	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merger * Asset Growth	C4*C3	?	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Year 1999 Dummy	Y99		0.0000	0.0000	0.0000	0.0000		
Year 2000 Dummy	Y00		0.0000	0.0000	0.0000	0.0000		
Year 2001 Dummy	Y01		0.0000	0.0000	0.0000	0.0000		
Year 2002 Dummy	Y02		0.0000	0.0000	0.0000	0.0000		
Year 2003 Dummy	Y03		0.0000	0.0000	0.0000	0.0000		
Year 2004 Dummy	Y04		0.0000	0.0000	0.0000	0.0000		
Year 2005 Dummy	Y05		0.0000	0.0000	0.0000	0.0000		
Year 2006 Dummy	Y06		0.0000	0.0000	0.0000	0.0000		
Year 2007 Dummy	Y07		0.0000	0.0000				
Year 2008 Dummy	Y08		0.0000	0.0000			0.0000	0.0000
First-order Coefficient of Autocorrelation	AR(1)		-0.3214	0.1806 *	-0.3341	0.1844 *	0.1088	0.0168 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.1031		0.1111		0.0391	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%



# Appendix 71: Market Beta (MB) Regressions for All BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			MB	Std. Error	MB	Std. Error	MB	Std. Error
Activity diversification								
	C		-3.0517	0.4143 ***	-2.2648	0.4928 ***	-1.5958	1.4298
Domestic Geographic Div. (DGD)	H2	?	0.3536	0.4237	0.0012	0.5945	-0.3207	1.0208
Loan Div. (LD)	H3	?	-0.0454	0.2629	-0.0695	0.3962	-0.7266	1.0473
Security Div. (SD)	H4	?	-0.0092	0.0720	0.2180	0.0947 **	0.5744	0.4378
Non-interest-income Div. (NIID)	H5	?	-0.1249	0.0667 *	-0.0740	0.0912	-0.5022	0.2424 **
Off-balance-sheet Div. (OBSD)	H6	?	0.0292	0.0766	-0.0688	0.1108	0.0339	0.4102
Scale variables								
Deposit Ratio	S2	-	0.1270	0.1068	0.2688	0.1508 *	0.1395	0.4121
Loan Ratio	S3	?	0.1752	0.2314	0.2337	0.3186	-0.2437	0.9353
Security Ratio	S4	?	-0.0838	0.1528	-0.1769	0.1951	0.1912	0.9267
Non-interest-income Ratio	S5	?	-4.1935	3.6098	-2.0355	4.1213	-32.6438	19.7500 **
Off-balance-sheet Ratio	S6	?	-0.0016	0.0036	0.0014	0.0049	0.0501	0.0355
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-0.2790	0.4259	-0.1606	0.5772	-0.3318	1.0830
Loan Div. (LD)	H3*S3	?	0.0065	0.4622	-0.2011	0.6798	1.4686	1.6741
Security Div. (SD)	H4*S4	?	-0.2415	0.2639	0.1315	0.3980	0.0904	1.4183
Non-interest-income Div. (NIID)	H5*S5	?	6.7332	5.9316	3.5510	6.5747	23.1467	33.2070
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.0217	0.0110 **	-0.0234	0.0134 *	-0.0876	0.0597
Activity interaction								
DGD * LD	H2*H3	?	-0.0037	0.5186	0.6307	0.7045	-0.3293	1.4128
DGD * NIID	H2*H5	?	-0.2322	0.1915	-0.1204	0.2686	1.5594	0.8114 *
SD * OBSD	H4*H6	?	0.1285	0.1214	0.1680	0.1893	-0.1971	0.8003
All Activities	H2*H3*H4*H5*H6	?	-1.6055	0.7916 **	-2.1294	1.1199 *	-5.8925	3.3787 *
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0150	0.1333	0.0615	0.1602	-0.1602	0.1774
Log Asset	C1	?	0.5116	0.0530 ***	0.3531	0.0636	0.4087	0.1179 ***
Equity Ratio	C2	?	0.2930	0.6012	0.1507	0.8001 ***	0.4247	1.2697
Asset Growth	C3	+	-0.0659	0.0263 **	-0.0309	0.0386	-0.0896	0.1461
Merger Dummy	C4	?	-0.0069	0.0074	-0.0151	0.0117	-0.0449	0.0328
Merger * Asset Growth	C4*C3	?	0.0082	0.0514	0.1014	0.0815	0.1127	0.1817
Year 1999 Dummy	Y99		0.0187	0.0075 **	0.0431	0.0110 ***		
Year 2000 Dummy	Y00		0.0564	0.0128 ***	0.0961	0.0194 ***		
Year 2001 Dummy	Y01		0.1370	0.0253 ***	0.1148	0.0364 ***		
Year 2002 Dummy	Y02		0.1735	0.0278 ***	0.1696	0.0411 ***		
Year 2003 Dummy	Y03		0.2046	0.0317 ***	0.2235	0.0471 ***		
Year 2004 Dummy	Y04		0.2434	0.0349 ***	0.2839	0.0516 ***		
Year 2005 Dummy	Y05		0.2889	0.0381 ***	0.3510	0.0560 ***		
Year 2006 Dummy	Y06		0.4534	0.0407 ***	0.5317	0.0596 ***		
Year 2007 Dummy	Y07		0.4967	0.0445 ***				
Year 2008 Dummy	Y08		0.5469	0.0470 ***			0.0389	0.0270
First-order Coefficient of Autocorrelation	AR(1)		0.9558	0.0064 ***	0.9101	0.0150 ***	0.8679	0.0164 ***
Observations			4878		3926		951	
Adjusted R-squared			0.9528		0.9179		0.7667	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

## Appendix 72: Interest Rate Beta (IRB) Regressions for All BHCs

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			IRB	Std. Error	IRB	Std. Error	IRB	Std. Error
Activity diversification								
	C		0.2400	0.1211 **	0.3695	0.1194 ***	0.6942	0.4068 *
Domestic Geographic Div. (DGD)	H2	?	-0.2842	0.1883	-0.2498	0.1698	-0.3251	0.4130
Loan Div. (LD)	H3	?	0.0765	0.1310	-0.0087	0.2148	0.1799	0.3949
Security Div. (SD)	H4	?	-0.0117	0.0336	-0.0207	0.0273	0.0302	0.1635
Non-interest-income Div. (NIID)	H5	?	-0.0094	0.0330	-0.0229	0.0250	-0.0160	0.1229
Off-balance-sheet Div. (OBSD)	H6	?	0.0718	0.0352 **	0.0757	0.0396 *	0.3434	0.1166 ***
Scale variables								
Deposit Ratio	S2	-	0.0271	0.0527	-0.0302	0.0562	-0.1207	0.1320
Loan Ratio	S3	?	0.0136	0.1075	-0.1268	0.1608	-0.1141	0.3731
Security Ratio	S4	?	-0.2791	0.0853 ***	-0.2389	0.0964 **	-1.0763	0.3966 ***
Non-interest-income Ratio	S5	?	0.3286	2.1157	-2.3968	1.4429 *	1.6741	10.3818
Off-balance-sheet Ratio	S6	?	-0.0004	0.0026	0.0002	0.0027	0.0076	0.0167
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	0.0105	0.1679	0.1394	0.1449	0.0201	0.4844
Loan Div. (LD)	H3*S3	?	-0.3174	0.2003	0.0405	0.3058	-0.3223	0.5830
Security Div. (SD)	H4*S4	?	0.3686	0.1454 **	0.3074	0.1568 *	1.2236	0.6145 **
Non-interest-income Div. (NIID)	H5*S5	?	-0.8657	3.5819	3.4042	2.4568	-11.7163	16.9428
Off-balance-sheet Div. (OBSD)	H6*S6	?	0.0019	0.0053	0.0011	0.0050	-0.0119	0.0290
Activity interaction								
DGD * LD	H2*H3	?	0.2820	0.2257	0.1341	0.1993	-0.1630	0.4990
DGD * NIID	H2*H5	?	0.1841	0.0994 *	0.1503	0.0948	0.3710	0.3294
SD * OBSD	H4*H6	?	-0.1279	0.0640 **	-0.1050	0.0547 *	-0.4790	0.2160 **
All Activities	H2*H3*H4*H5*H6	?	0.1447	0.3376	-0.0822	0.3235	1.4882	1.0030
Control variables								
International Loan Activity Dummy	ILAD	+	-0.0250	0.0257	-0.0161	0.0284	0.0439	0.0473
Log Asset	C1	?	-0.0042	0.0127	-0.0220	0.0168	-0.0483	0.0281 *
Equity Ratio	C2	?	-0.7796	0.2639 ***	-0.0790	0.2313	-1.6262	0.5262 ***
Asset Growth	C3	+	-0.0184	0.0162	-0.0085	0.0138	0.0000	0.0847
Merger Dummy	C4	?	-0.0025	0.0056	0.0003	0.0055	0.0217	0.0210
Merger * Asset Growth	C4*C3	?	0.0072	0.0247	-0.0112	0.0235	-0.0809	0.0959
Year 1999 Dummy	Y99		-0.0002	0.0077	-0.0025	0.0049		
Year 2000 Dummy	Y00		-0.0497	0.0121 ***	-0.0499	0.0082 ***		
Year 2001 Dummy	Y01		-0.0925	0.0159 ***	-0.0867	0.0137 ***		
Year 2002 Dummy	Y02		-0.1333	0.0170 ***	-0.1336	0.0147 ***		
Year 2003 Dummy	Y03		-0.0460	0.0186 **	-0.0558	0.0151 ***		
Year 2004 Dummy	Y04		-0.0639	0.0193 ***	-0.0759	0.0151 ***		
Year 2005 Dummy	Y05		-0.1038	0.0200 ***	-0.1052	0.0154 ***		
Year 2006 Dummy	Y06		-0.0843	0.0195 ***	-0.0794	0.0156 ***		
Year 2007 Dummy	Y07		-0.0898	0.0198 ***				
Year 2008 Dummy	Y08		-0.2284	0.0181 ***			-0.1287	0.0134 ***
First-order Coefficient of Autocorrelation	AR(1)		0.7498	0.0171 ***	0.8198	0.0167 ***	0.5137	0.0391 ***
Observations			4878		3926		951	
Adjusted R-squared			0.6468		0.7199		0.3795	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%

**Appendix 73: Distance to Default (Z-Score) Regressions for All BHCs**

Variables	Variable Abbreviation	Expected Sign	Total period		Before the Crisis		During the Crisis	
			Z	Std. Error	Z	Std. Error	Z	Std. Error
Activity diversification								
	C		-18.98	107.05	-665.97	138.81 ***	-215.86	193.13
Domestic Geographic Div. (DGD)	H2	?	-21.85	100.39	51.19	145.16	528.53	225.78 **
Loan Div. (LD)	H3	?	63.28	109.00	260.66	136.39 *	293.60	192.67
Security Div. (SD)	H4	?	-6.86	15.97	-12.77	18.91	168.02	64.63 ***
Non-interest-income Div. (NIID)	H5	?	26.27	11.65 **	42.92	14.81 ***	-3.17	30.05
Off-balance-sheet Div. (OBSD)	H6	?	-10.85	21.45	2.64	24.21	43.21	66.51
Scale variables								
Deposit Ratio	S2	+	114.08	32.44 ***	136.37	44.08 ***	46.59	72.03
Loan Ratio	S3	?	153.87	95.50	345.98	118.50 ***	201.21	150.76
Security Ratio	S4	?	30.53	38.31	-19.91	46.19	339.70	147.80 **
Non-interest-income Ratio	S5	?	-806.28	472.34 *	-779.12	436.11 *	-6698.94	939.75 ***
Off-balance-sheet Ratio	S6	?	-0.18	1.31	-0.62	1.62	-0.84	8.20
Scale interaction								
Domestic Geographic Div. (DGD)	H2*S2	?	-116.18	85.10	-132.23	127.97	-372.36	229.44
Loan Div. (LD)	H3*S3	?	-152.29	192.25	-506.07	224.35 **	-274.70	261.17
Security Div. (SD)	H4*S4	?	183.37	79.74 **	193.60	99.99 *	-174.90	231.96
Non-interest-income Div. (NIID)	H5*S5	?	187.47	664.36	-110.23	621.57	7672.01	2884.02 ***
Off-balance-sheet Div. (OBSD)	H6*S6	?	-0.07	3.58	-6.02	3.76	2.53	14.34
Activity interaction								
DGD * LD	H2*H3	?	230.20	163.18	11.34	205.24	-761.11	346.17 **
DGD * NIID	H2*H5	?	21.17	68.61	17.65	78.15	162.07	149.30
SD * OBSD	H4*H6	?	18.71	37.03	-27.54	42.29	-160.37	111.04
All Activities	H2*H3*H4*H5*H6	?	-539.62	351.64	-571.25	387.63	-873.59	969.73
Control variables								
International Loan Activity Dummy	ILAD	-	20.84	40.21	-55.81	46.48	24.81	40.78
Log Asset	C1	?	0.67	13.99	84.18	18.05 ***	-4.42	18.37
Equity Ratio	C2	?	1171.91	186.86 ***	1109.31	197.15 ***	1564.75	200.65 ***
Asset Growth	C3	-	-6.11	11.10	-18.23	11.89	7.96	33.92
Merger Dummy	C4	?	-3.16	3.81	5.42	4.82	-2.77	11.66
Merger * Asset Growth	C4*C3	?	-29.82	24.71	-95.67	28.06 ***	4.11	47.90
Year 1999 Dummy	Y99		-11.12	2.83 ***	-5.35	3.12 *		
Year 2000 Dummy	Y00		-22.04	4.51 ***	-11.12	5.06 **		
Year 2001 Dummy	Y01		-57.11	9.49 ***	-35.27	9.42 ***		
Year 2002 Dummy	Y02		-74.41	10.49 ***	-47.76	10.42 ***		
Year 2003 Dummy	Y03		-84.57	11.48 ***	-54.17	11.48 ***		
Year 2004 Dummy	Y04		-77.86	12.50 ***	-43.40	12.44 ***		
Year 2005 Dummy	Y05		-82.71	13.31 ***	-44.39	13.37 ***		
Year 2006 Dummy	Y06		-94.70	13.88 ***	-50.53	13.99 ***		
Year 2007 Dummy	Y07		-108.00	14.72 ***				
Year 2008 Dummy	Y08		-126.68	15.47 ***			-55.67	5.13 ***
First-order Coefficient of Autocorrelation	AR(1)		0.91	0.01 ***	0.90	0.01 ***	0.80	0.02 ***
Observations			18121		14585		3535	
Adjusted R-squared			0.8387		0.8277		0.6823	

Total period: 1998 Q4 - 2008 Q4

Before the crisis: 1998 Q4 - 2006 Q4

During the crisis: 2007 Q1 - 2008 Q4

\*\*\* Significance level at 1%

\*\* Significance level at 5%

\* Significance level at 10%